NOTE

This Microfiche meets the quality requirements of the American National Standard for Microfiche of Documents (ANSI PH5.9-1975). However, because of imperfections in the document from which it was made, it contains images that are illegible or difficult to read. The source document for this microfiche is the best copy that could be obtained prior to filming.

CIS
Congressional Information Service
Washington D C

S. HRG. 101-185

GRAIN QUALITY ISSUES AFFECTING U.S. FARMERS

HEARING

BEFORE THE

SUBCOMMITTEE ON AGRICULTURAL RESEARCH AND GENERAL LEGISLATION

OF THE

COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

GRAIN QUALITY IN THE UNITED STATES SINCE THE PASSAGE OF THE GRAIN QUALITY IMPROVEMENT ACT OF 1986; TO REVIEW THE OFFICE OF TECHNOLOGY ASSESSMENT STUDY ON GRAIN ENTERING THE EXPORT MARKET; AND LEGISLATIVE CHANGE, IF ANY IS NECESSARY, TO ENSURE GRAIN QUALITY IS CONTINUALLY IMPROVED

MARCH 22, 1989—HURON, SD

Printed for the use of the
Committee on Agriculture, Nutrition, and Forestry

U.S. GOVERNMENT PRINTING OFFICE
20-094 WASHINGTON : 1989

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S161-27

COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY

PATRICK J. LEAHY, Vermont, *Chairman*

DAVID H. PRYOR, Arkansas
DAVID L. BOREN, Oklahoma
HOWELL HEFLIN, Alabama
TOM HARKIN, Iowa
KENT CONRAD, North Dakota
WYCHE FOWLER, Jr., Georgia
THOMAS A. DASCHLE, South Dakota
MAX BAUCUS, Montana
J. ROBERT KERREY, Nebraska

RICHARD G. LUGAR, Indiana
ROBERT DOLE, Kansas
JESSE HELMS, North Carolina
THAD COCHRAN, Mississippi
RUDY BOSCHWITZ, Minnesota
MITCH McCONNELL, Kentucky
CHRISTOPHER S. "KIT" BOND, Missouri
PETE WILSON, California
SLADE GORTON, Washington

CHARLES RIEMENSCHNEIDER, *Staff Director*
JAMES M. CUBIE, *Chief Counsel*
CHRISTINE SARCONE, *Chief Clerk*
CHARLES CONNER, *Staff Director for the Minority*

SUBCOMMITTEE ON AGRICULTURAL RESEARCH AND GENERAL LEGISLATION

THOMAS A. DASCHLE, South Dakota, *Chairman*

J. ROBERT KERREY, Nebraska

PETE WILSON, California
CHRISTOPHER S. "KIT" BOND, Missouri

CONTENTS

Page

Hearing held on: March 22, 1989 1

GRAIN QUALITY ISSUES AFFECTING U.S. FARMERS

WEDNESDAY, MARCH 22, 1989

Daschle, Hon. Thomas A., a U.S. Senator from South Dakota, opening statement 1

CHRONOLOGICAL LIST OF WITNESSES

Swisher, Jay C., Secretary of Agriculture, South Dakota department of agriculture, Pierre, SD 3
Prepared statement 37
Phillips, Michael J., Ph.D., Senior Associate, Food and Renewable Resources Program, Project Director, OTA's study on grains, Office of Technology Assessment, Washington, DC 5
Prepared statement 38
"Enhancing the Quality of U.S. Grain for International Trade," Summary, Congress of the United States, Office of Technology Assessment 50
Orr, David, Deputy Director, Field Management Division, Federal Grain Inspection Service, USDA, Washington, DC 8
Prepared statement 44
Hawkins, Jerry, South Dakota wheat producer, South Dakota wheat commissioner, member, board of directors, Pierre Farmers Elevator, Pierre, SD 13
Prepared statement 45
Diedrich, Larry, soybean farmer, former president, South Dakota Soybean Association, Elkton, SD 15
Prepared statement 47
Ingle, Scott, secretary, South Dakota Corn Growers, Pierre, SD 16
Hofer, Arnie, manager, South Dakota Wheat Growers Association Elevator, Huron, SD 20
Wendland, Dennis, vice president, grain marketing, Harvest States Cooperatives, St. Paul, MN 21
Broin, Jeffrey S., manager, Broin Enterprises, Inc., ethanol plant, Scotland, SD 24
Prepared statement 49

OPEN MICROPHONE TESTIMONY

Tonsager, Dallas, president, South Dakota Farmers Union, Huron, SD 28
Jones, Larry, Norwest Corporation, Sioux Falls, SD 29
Hall, Rod, farmer, Fulton, SD 30
Hainy, Keith, division manager, South Dakota Wheat Growers, Aberdeen, SD. 31

GRAIN QUALITY ISSUES AFFECTING U.S. FARMERS

WEDNESDAY, MARCH 22, 1989

U.S. SENATE, SUBCOMMITTEE ON AGRICULTURAL RESEARCH AND GENERAL LEGISLATION OF THE COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,

Huron, SD.

The subcommittee met, pursuant to notice, at 10 a.m., in the South Dakota Wheat Growers Association Elevator, Huron, SD, Hon. Thomas A. Daschle (chairman of the subcommittee) presiding.

Present or submitting a statement: Senator Daschle.

Senator DASCHLE. We will get started if everyone would take a seat. The premium seats are over here by the room heater. I really want to thank Arnie Hofer of the South Dakota Wheat Growers for hosting our hearing this morning. Everybody is more than welcome to keep on their coats, that is for sure, and we will try to warm this place up with both rhetoric and a lot of body heat before the time is over with, but we really appreciate everyone's willingness to come and participate in this hearing.

STATEMENT OF HON. THOMAS A. DASCHLE, A U.S. SENATOR FROM SOUTH DAKOTA

This is the first field hearing of the Subcommittee on Research and General Legislation to be held in the 101st Congress. It is a very important hearing for a number of reasons. We feel very strongly about the need to continue to improve grain quality, the need for all of us to be cognizant of how far we have come with regard to grain quality, and obviously our hope to better judge whether grain quality policy in this country is as good as it can be. Can everybody hear me all right? A lot of people are going like this already. It is good that we have a day as warm as it is. I hear it is going to get to almost 40, 50 degrees today, so it should warm up pretty well.

It reminds me of the story about the farmer right on the line between North and South Dakota who lived most of his life thinking he was in North Dakota until one day a surveyor came along and told him that he actually lived in South Dakota rather than North Dakota, and they had been mistaken all these years, and he said, "thank goodness, I couldn't take another one of those North Dakota winters." [Laughter.]

But we are now in the second day of spring in South Dakota, and you can tell that it is warming up outside and I think it will warm up in here.

We have a lot of jurisdictions in our Subcommittee on Research and General Legislation and one of the jurisdictional responsibilities is over the Federal Grain Inspection Service. The purpose of this hearing is really threefold.

The first is to get the best understanding possible of the current state of grain quality in the United States since the passage of the Grain Quality Improvement Act of 1986.

The second is to review the study that was just released by the Office of Technology Assessment regarding the quality of grain that we have as it leaves the United States and enters the export market. I have a copy of the report in my hand, and will be talking a good deal about that in the hearing this morning.

The third is to consider if any legislative change is necessary, with regard to the law to ensure that grain quality can continually be improved.

Grain quality, of course, is affected by many distinct factors and these charts outline some of those factors. Moisture, weight, heat, foreign material, and insects are all factors as you can see on this chart here. Also, of course, grain quality is affected by the components in the grain system, variety development, the grain standards and, of course, producers, handlers, and the end users. So it is a very complicated process, evaluating grain quality and grain quality policy in this country. Obviously we are not going to get all the answers today, but we want to develop a better understanding for the official Agriculture Committee record in determining what, if any, changes need to be implemented. As international competition for grain increases, so does the need to demand the best inspection, the greatest care and handling, and the highest attention to improved genetics. I have to admit at the outset, while I am pleased with some of the progress we have made in the last couple of years, I think we can go a long way to improve upon what we have done so far. Our world market share of 40 percent for soybeans and wheat and 80 percent for corn will clearly be threatened if we do not continue to demand the highest quality product around the world.

The grain quality which reaches foreign shores ought to be as clean and as high a quality level as we can possibly bring, and certainly as high as what is brought into the elevators in most cases. Cleanliness alone will not be enough. We have to demand quality and we have to demand continuity. My hope today is we can begin developing an official record that can lead us to these goals and the testimony we are going to receive this morning will be very helpful in that regard. We have experts from FGIS, who on a daily basis handle grain, and the Office of Technology Assessment, who can give us a good insight as to the current state of grain quality in the United States today.

One person who deals with grain policy on a day-to-day basis and is as knowledgeable about many of the aspects of grain quality from a South Dakota perspective as anybody can be is our own Secretary of Agriculture. He has made changes in his schedule and in fact cannot stay the entire time, but certainly has made substantial changes in his schedule to be here to participate in the opening part of our session today and I would like to introduce at this time

our own South Dakota State Secretary of Agriculture Jay Swisher for any comments he would like to make initially. Jay.

STATEMENT OF JAY C. SWISHER, SECRETARY OF AGRICULTURE, SOUTH DAKOTA DEPARTMENT OF AGRICULTURE, PIERRE, SD

Mr. SWISHER. Senator Daschle, thank you. It is obvious why I am not taking my hat off and I need a seat warmer pretty bad because these are pretty thin pants and that seat is cold.

One of the very first questions I asked the second day that I was in the job of Secretary of Agriculture, I asked Ben Handcock, who is executive secretary for the wheat industry in South Dakota, what is the problem with our clean wheat and all the complaints we have worldwide about all the foreign material that comes in our wheat? The scenario that comes from Ben was this, and I want to tell you that first and then I want to go on and tell you what has happened afterwards.

Ben says this has happened in the past, and he says I want to clear this up. This is not something that we can document, but it is a story that goes around. And that is the people from the foreign countries come here and they take them out on wheat buying trips and they take them out to some notable farmer and show him this really great wheat, a whole bin full of Dark Northern maybe Spring or Winter wheat and it is a No. 1. The best wheat the man has ever seen in his life. He says that is what we want. So they go back home and they send their wheat buyer over and they get in to their wheat conflab here, specifications and how much it is going to cost, and they start their bidding and everything goes through and they buy wheat. They find out that there is about anywhere from 10 cents to $1 difference between No. 1 wheat and No. 3 wheat, and being the wheat buyer that he is, he looks at the difference in the quality, he looks at the difference in the money and he buys No. 2 or No. 3 wheat, the wheat is loaded here on a unit car, sent to Seattle and shipped to the purchaser, and to the miller that was over here, and the wheat people that were here first, and they look at that wheat and say my gracious, this is not the wheat we bought, it has damage, dockage, gravel, and barley in it, everything but pure wheat like we saw in that man's bin. What in the world happened. We were charged by our wheat buyers for that No. 1 wheat that we saw out in that bin. So they go back and they look and they see that they bought No. 2 wheat, and exactly the specifications they bought is exactly what they had delivered to them. If they would have bought No. 1 wheat for No. 1 price, that would have been delivered to them.

Our FGIS inspection people have inspected over 5,000 shipments of wheat, and out of those 5,000, and in my prepared statement it will tell you exactly the number, of those 5,000 samples, there were only 34 that were ever complained about. That was less than 1 percent. We felt that is not a bad, that is not a bad percentage. That is a very good percentage. The one thing I will say is that that is head and shoulders above what it was 10 years ago. It is even head and shoulders over what it was 6 months ago. The people that, in our State and in the Nation, in fact the industry themselves are cleaning up their act. They have found out that they have to be

more honest with the people they are selling the grain to. Why? Because the people that are buying it are becoming better purchasers, and we feel in the industry, and in my position, and I think in all of our wheat peoples position that we have to deliver exactly what the specifications say they are.

We have a scenario in my prepared statement that tells about the soybeans over in Portugal. They were complaining the Brazilian beans were so much better than the American beans, and they found out that the American beans were No. 2 beans and that is what they had bought and paid for and the Brazilian beans were No. 1 beans and that is what they had bought and paid for. Our No. 1 beans were just as good as theirs, the only thing there was a price differential. The thing about it we are advocating, so far as the industry is concerned is that we have to educate the purchasers, if they buy something of lesser quality, they are going to pay, and pay for lesser quality, that is probably what they are going to get. They are not going to get No. 1 quality if they pay for No. 2 or No. 3. So it is an education program to the purchasers.

The one thing, and I do not know exactly what this tells me, because I have not been able to totally evaluate it yet. The 6 months that I have been in the office that I hold in the State Department of Agriculture, I have had a request for 600,000 bushels of corn in two different orders, and specified absolutely nothing but South Dakota corn. We have had a request for 100,000 tons, metric tons of buckwheat, and it had to be South Dakota buckwheat. We have had orders for absolutely nothing but South Dakota wheat. I do not know exactly what that is telling us. It is telling us that they want it shipped from a unit car shipping point to an area where it can be shipped out, probably not by the boatload but by the cubic load, where they can load smaller loads than just a full boatload.

So these are some things we are looking at right now. We do not know just exactly what it is telling us yet until we see down the road how successful we can do it. Those orders have been handled I might add. That is not our job to do this, we are turning this over to persons in marketing at the statehouse, and we are also turning it over to the industry and letting them handle that program. So this is a little bit different wrinkle than we have had in the past and I think it is saying an awful lot for South Dakota grain and what they have been getting knowing that they have been getting South Dakota grain.

With that I am going to close and say that it is my recommendation that we see and allow the industry to go ahead and progress and see how much better they can make their industry without a lot more regulation, thank you, Tom.

[The prepared statement of Mr. Swisher appears at the conclusion of the hearing.]

Senator DASCHLE. Thank you, Jay.

Let us begin the first panel this morning with the introduction of our first witnesses. Mike Phillips is the Project Director of the Office of Technology Assessment who had a lot to do with the fact this report is written and he will talk about the report and answer questions in that regard. David Orr is the Deputy Director of Field Operations for the FGIS, and he is responsible for all the national field offices. Accompanying David is Tom Wrenn who is the field

office manager for this region. Tom will be here to answer questions specific to our region of North and South Dakota. I want to welcome them at this time and call on Mike Phillips to present our first testimony this morning.

STATEMENT OF MICHAEL J. PHILLIPS, Ph.D., SENIOR ASSOCIATE, FOOD AND RENEWABLE RESOURCES PROGRAM, PROJECT DIRECTOR, OTA'S STUDY ON GRAIN, OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, DC

Mr. PHILLIPS. Thank you, Senator Daschle, for inviting us to participate in this hearing today.

I would like to first of all say that there are two reports [1] that are back there. One that you see that Senator Daschle and I have up here which is the main report that focuses on the United States; a companion report documents the systems of other countries that we compete with in the international market. We want to be sure that you all get a chance to have that document as well, because we think it is very important to know what we are competing against in international markets.

If it is OK, I will briefly summarize my prepared statement. The statement should be available. It gives a quick overview of the study and I would just like to make a few key points from the statement before we go to questions and answers.

OTA STUDY

This is a study that was requested by the Congress. Our office is a research support agency for the Congress. We do many studies of the type that you see here. This study was requested a little over 2 years ago by the Senate Agriculture Committee, by the House Agriculture Committee, and others, to look at our system because of the concerns about grain quality.

COMPLAINTS

The statements made here earlier this morning by the Secretary of Agriculture for South Dakota are very typical of the kinds of statements we have heard all over the United States, whether talking about wheat, corn, or soybeans. Complaints during the decade of the eighties have increased much more than any other time in the history of the country, and they caused the Senate and House Ag Committees to really focus in on why we were losing market share, what portion of this was due to quality and what is it that we need to be doing to enhance quality.

COMPETITION

One of the startling realizations I think we are all realizing in this grain market business is that the competition out there any more is very, very keen. There are many more suppliers of grain in world markets today than there were just 10 years ago. And what that means is that there are many more countries that are vying for markets that we traditionally thought of as ours, and are now open for anyone that can meet the price along with quality. So it

[1] These reports are retained in the subcommittee file.

means that we are going to have to do a better job than we have in the past of looking at some aspects of our grain business, quality being one of those, that maybe we have taken a little bit for granted and to think about how we can enhance quality, because as the Secretary mentioned earlier, buyers are becoming much more sophisticated, they are asking for many more requirements of grain than we have had in the past, and one boatload of wheat is not similar to another boatload of wheat to them, it depends on the end use, and buyers are becoming much more sophisticated in terms of asking for different specs, their processing technologists are requiring that the grain come in more exact, and particularly more uniform, and this is one of the problems that we have had in terms of U.S. grain.

One of the biggest complaints buyers have indicated to us, and we have illustrated on this chart, is the uniformity between shipments, because they do not receive grain that is uniform from one boatload to the next, and for their processing technologies that are more sophisticated today it requires more uniformity of product, and so that is going to be a continuing change that we are going to see in the marketplace. It will demand uniformity. And it is one of the areas that we lay out in the report based on the surveys that we did of our overseas buyers. It is a problem that we are going to have to work on in this country.

COMPETITORS' POLICIES

One of the interesting aspects of the study was that we did take a comprehensive look at our competitors, and looked at what is it that they do that maybe is different than what we do. And we found that one thing we can say for sure is that there is not much difference in the technologies. Our country versus any of the countries we compete with. Technology has pretty much been transferred around the whole United States, and throughout the world, and so we found that when you talk about harvesting technologies, handling technologies, or ship loading technologies, they do not differ much at all, but what does differ is that countries have different kinds of institutions and policies than we do here in the United States. And much of that is integrated around quality.

For many of those countries they say there are many areas that they cannot compete with the United States on in international markets, they cannot compete with the United States in regards to sheer volume of grain that we can market, or all the different types of grains the United States puts in the international market, or they cannot compete on credit terms that the United States can make to an overseas buyer. But the one area they do think they can compete with us is quality. They say that that is probably the U.S. Achilles' heel in the international marketplace, and so they have intensified their efforts to put institutions and policies in place that enhance quality, and price being equal, they think they can probably out compete the United States on the quality aspect. So, that was a fairly sobering fact to come away with out of many of these countries is that they are going after that part of the marketplace that is differentiating on the quality side, and we are finding that as we understand buyers better now, they are beginning to

differentiate more on the quality aspects, and in fact, in the survey that we did when we asked from what country do you prefer grain, particularly wheat with price being equal, we found that the United States did not rank first in any kind of end use. The best we came in was second, whether you are talking about breadmaking wheat, pasta wheat, or wheat for cookies and baked goods. So it points up to us that we probably have quite a bit of work we need to do if indeed we are going to look at the quality aspect to enhance our competitiveness in world markets.

VARIETY DEVELOPMENT

One concluding thought that I would just like to leave with you is that when we have talked about quality in the United States, the debate has focused on one aspect of the system for the most part, and that has been grain standards. And the one thing that we come away with from the study is that if we are really serious about doing something about quality, we have to look beyond just making changes in grain standards. As the Senator pointed out, there are many facets of this industry that we have to understand better and understand how they relate to one another. An important area is variety development.

In other words, the kind of incentives that plant breeders have for the kinds of seed that they are going to breed for because that is where it all begins, the whole area of the marketplace itself, understanding how producers make decisions on variety selection, the kind of cultural practices that are used and particularly farm programs. And one of the things that we found in the course of the study is that our farm programs are probably going to have to be changed if indeed we are going to look at the whole quality picture in a comprehensive fashion, because we currently have policies in place with our target price program and our loan programs that drive us in the opposite direction of quality, because we have emphasized yield so much that any plant breeder will tell you the more you go for yield, the less you have in terms of what we call the intrinsic quality characteristics.

In wheat, take protein for example, the biological relationship between yield and protein is an inverse one, the higher the yield, the lower the protein content. And so we have policies in place that as we all know we have put such an emphasis on yield that it has then driven us the opposite way in terms of quality. The handling practices that take place, country elevators, terminal markets, as well as what the end users want. If you look at the variety development, the market for quality characteristics and grain standards, we have to look at that as an entire system and we have to understand that if we make changes in one aspect of the system, it has implications for others, and what we try to do in this report is lay out what those relationships are, and then we tried to come in at the end of the study to suggest changes within the system, what makes sense in terms of changes in variety development, changes we would make that reflect in the market for quality characteristics, particularly in our farm programs, as well as changes in our grain standards that we would come away with not only keeping the advantages that this country has in terms of competitiveness,

because we have many, but also at the same time enhancing the one area that probably is our Achilles' heel in international markets—the quality area.

So that is what the study has attempted to do. The prepared statement gives an overview of what those changes might be as well. We do have copies of the report for you.

Senator, that will conclude my brief comments and I will be more than happy to try to answer questions that you or anybody here may have.

[The prepared statement of Mr. Phillips appears at the conclusion of the hearing.]

Senator DASCHLE. Thank you very much, Mike.

Our second witness is, as I introduced at the beginning, the Deputy Director of Field Management Division of the Federal Grain Inspection Service, David Orr. Dave.

STATEMENT OF DAVID ORR, DEPUTY DIRECTOR, FIELD MANAGEMENT DIVISION, FEDERAL GRAIN INSPECTION SERVICE, USDA, WASHINGTON, DC

Mr. ORR. Thank you Mr. Chairman. We provided you with a copy of our prepared testimony and I will try to be brief in summarizing it.

We are very pleased at FGIS that the areas identified in the OTA report that specifically address FGIS we have been working on for quite a while. We have been doing a lot of work over the past several years in trying to develop more objective testing technologies. We are going to continue in that line and I think it is spelled out very clearly in the OTA report that this is something that FGIS should be working on. I would like to take a couple of minutes, if you do not mind, to give a brief overview of what FGIS is and what some of our responsibilities are.

OVERVIEW OF FGIS AND RESPONSIBILITIES

We are an agency of the Department of Agriculture and are basically charged with two tasks:

First, is to develop the standards that are used for marketing grain.

Second, is to provide for an independent third-party inspection system in the United States.

Most of you may or may not know, all grain exported from the United States must be inspected by the Federal Grain Inspection Service using the standards.

Inspection services in the interior of the United States are available upon request by contacting any of our local field offices.

LEGISLATION—NEW AREAS TO LOOK AT

We have been pleased, Mr. Chairman, that over the last several years the Grain Quality Improvement Act, that Congress passed, has given us two new areas to look at.

The first one being the prohibition of combining dockage and foreign material or dust once it is removed from grain, and also reducing some of the blending possibilities. This has really addressed general handling practices. That kind of legislation was a first for

FGIS in that it put us in a regulatory mode. It also put us in a position where we can assess criminal penalties up to $75,000 for individuals that violate that act. I do not know whether you are aware or not, but we have just finished a case this last October on someone that deceptively loaded railroad cars and they were assessed a $9,000 penalty. We also have denied them official inspection services. So that piece of legislation has given us some power to try to handle regulatory practices and we are looking at it actively.

The other part of the legislation we feel very good about was for the first time it gave us some criteria for how to develop a standard. The legislation outlined four very broad objectives that standards should try to meet. It is a first for us, and we are in the process of examining our standards and will use those guidelines as we move forward.

RESEARCH PROJECTS

I would like to just very briefly bring some of the research projects to your attention that we are involved with because as I indicated earlier we are moving toward more objective testing. We are trying to provide more information for both buyer and seller to market on.

We are currently looking at developing methodology to detect hidden insect infestation in grains, and also reviewing our current procedures for checking live adult insects. As most of you know that have been involved with wheat, we have been actively looking at objective tests for classing of wheat. The visual system that is in place right now has caused tremendous problems in the inspection area. We are also looking at expanding the availability of the Falling Number Test for sprout damage to all wheat at porting locations. Every one of our export offices should have that accomplished shortly.

We are also looking at more rapid and accurate procedures for determining the presence of aflatoxin in corn. New technology is on the horizon that will allow us to do that quicker and safer. We are also looking at digital imagery for determining net sound grain and damaged kernels.

We are also looking at near infrared technology for barley protein and corn protein, oil, starch, and moisture. Some of you may have heard that come September we are going to be offering protein and oil testing services on soybeans which will be a first in that area.

We are also looking at instrumentation that will help us to better detect odors.

So we are actively working on a lot of fronts, Mr. Chairman, in trying to develop objective testing which we feel we need to do. I brought along some packets that your people might want to pick up that are on the front table that gives a good explanation of what FGIS is doing and highlights some of our accomplishments in the grain quality area over the last several years. I also brought along some samples that are back on that table that represent ship loadings. We had the samples pulled from vessels. We have a sample of No. 2 corn and No. 3 corn, No. 2 soybeans and No. 2

Spring wheat, and No. 2 Hard Red Winter wheat back there. They are on the back table as you walk in the door. Those samples are actual samples from the vessels that were loaded within the last week. So if you want to take a look, this is really what the grain looks like as it is going out of this country.

Thank you for the opportunity and I am willing to field any questions.

[The prepared statement of Mr. Orr appears at the conclusion of the hearing.]

Senator DASCHLE. Thank you both for your testimony.

Let me start by asking Dave a question. Dave, Mike said that from what he could tell having studied this and now issued the report, the Achilles' heel, as he put it, to international marketing of U.S. grain is quality.

We have now seen 2 years go by since the passage of the Grain Quality Improvement Act of 1986. Tell us, what statistics do you have that would demonstrate grain quality has improved as a result of passage of that act; has it improved in terms of No. 1, dockage; and No. 2, foreign material?

Mr. ORR. As you and I discussed earlier this morning, when you just look at numbers on grain quality, we have not seen a significant improvement. I have some figures here from 1986 which represents the average amount of foreign material and dockage in all our vessels loaded prior to the Grain Quality Improvement Act and 1987 data which is the first year under it.

In Hard Winter Red in 1986 the average FM was three-tenths, in 1987 it was also three-tenths. Dockage in 1986 was 0.7 percent, and in 1987 it was 0.6. On the Spring wheat side, 1986 FM was three-tenths as compared to three-tenths in 1987, and dockage was nine-tenths and nine-tenths respectively. I can go on because I have some other grains listed here. I will use corn for an example, BCFM for No. 3 corn in 1986 was 3.6 percent and 1987 was also 3.6. The numbers are not showing necessarily an increase, but I would like to point out that that law is really dealing with handling practices. There is a hidden value, I believe, here. Once dust is removed from grain and binned, it is no longer allowed to be added back in. Screenings cannot be added to grain. These regulations may not be reflected in these numbers, but these areas are definitely handling practices which are being prohibited and have to be helping our image.

Also, if any of you worked in an elevator you know you get involved with sweeping and cleaning, we have all seen people that have just gone ahead and swept matter into the top of the bin or dumped it into the pit. Those types of activities are prohibited also. So even though the numbers are not reflecting anything, I think underneath the surface we have definitely made some gains for improving grain quality.

Senator DASCHLE. Mike and David, I will ask both of you the same question. Secretary Swisher said really it is a question of getting what you pay for. I mean if you want to pay for the highest quality of grain you can get it. If you are going to accept some discounted products, you are going to get a lower price. But you say the Achilles' heel is quality, and that we do not even rank No. 1 in any one of the different categories by which quality is judged. Why,

if you get what you pay for, wouldn't our buyers abroad be content with buying a quality product at a premium price?

Mr. PHILLIPS. Well, a large part of that goes back to just the way the marketplace works. Because in the surveys that we have done, and in the studying of our other systems, we find that you do not have to go out of your way as a buyer to many of our foreign competitors to get the quality that they want.

Yes, you can come into the United States and you can put specs in a contract and say this is what I want, and of course our retort is if that is what you want, that is going to cost you a little bit more. With other competitors, that is not the response they get. They come in and buy the highest standards of that country, and end up with a product that they are very satisfied with. So what essentially buyers are saying to us is the United States is sort of out of sync, we have to go through hoops and hurdles when we come to the United States, we do not have to do that if we go to Australia, we do not have to do that if we go to Canada.

Senator DASCHLE. Dave, do you have anything to add to that?

Mr. ORR. No, I support Dr. Phillips' statement. I will point out that the system we have in place now from the standards and the service that FGIS is providing is that we can respond to the different requests for various tests. This is one of the areas that we are expending a lot of funds and time on right now to get those kinds of tests online to meet the demand. We are seeing more and more specifications showing up in contracts and we are being asked to test for them. As this continues, the pressure is going to be on us to develop the rapid testing technologies to be able to accomplish that activity at our port locations.

Mr. PHILLIPS. One followup to that. As Dave pointed out, the Grain Quality Improvement Act set out for the first time a very comprehensive way in which standards now should be looked at, those four objectives.

Prior to that, basically all FGIS had to work with was one criteria for standards, and that criteria was facilitation of trade. And that is basically what our standards do, they do an excellent job of facilitating trade, but now the Congress has added, and I think very much in the proper direction for quality, many other aspects that standards now are to take in account such as storability, such as end use characteristics, and as FGIS makes changes in the standards that reflect now this more comprehensive look at quality, we will begin to be able to have standards in place that are more in line with the competitors that we compete with in international markets and that will go a long ways toward helping the whole quality issue and make quality not as much our Achilles' heel.

Senator DASCHLE. Let me ask you this, Mike, would you, from what you can tell of the standards we have set as they compare to other countries and how that affects competitiveness, would you take it one step further and give FGIS the power to eliminate certain grain for export that does not meet certain minimum standards?

Mr. PHILLIPS. Well, that is a very interesting question. One of the things that we did learn that I think is very important to understand, is that for all intents and purposes, we are the only country

in the world that does not have some type of minimum grade specification of what is allowed to go in to export channels. Almost every other country that we studied has what they call a minimum receivable standard, and what that essentially means is that grain that goes in to export channels has to meet a minimum grade specification or it is not allowed into the export house at all, and that really minimizes a lot of the problems they have in terms of their export marketing.

We, on the other hand, have a system in which as long as you are willing to take the discounts, you can put any quality of grain into our system. You can put sample grade in. Grade 5, grade 4, and handlers will then do the best job they can of working that through the system and still trying to give the end user what they have asked for. And so it asks an awful lot of our handling system to be able to do that, because what you end up with then, particularly as you try to blend to come up with a product that the end user wants is that you have a whole wide range of quality to have to blend, store, deal with, as opposed to other countries, and in other countries it means that they have a more uniform and basically higher quality grain that they work with at the export house or the terminal prior to the export house. That then means they do not have as much to blend, they do not have to blend over such a wide range and to handle, and they end up with a system that has worked very satisfactorily for them and they said they would not change that.

Senator DASCHLE. Jay.

Mr. SWISHER. You finally got down to the nitty gritty of the problem, that is the puzzling part of it, if the lower grades of the wheat were never offered for blending, we would put the quality of the wheat or any other grains that is raised in the United States with anything raised in the world. I have watched this grain be raised every place in the world from Russia, Argentina, France, Canada, every place, and I would not put any one of them in comparison to the Hard Northern Dark Spring wheat that we raise here in South Dakota, but for protein, for quality, for everything, for milling, anything you want to compare it to, we are superior or at least equal to anything they have. But when you start putting other wheats with it and inferior quality wheats with it, that is when we have become second rate wheat people.

So let us call the shots as they are. If you want good wheat, let us sell them good wheat. Let us not put it all in one bin and say that is all we have to offer. Let us make some specialty grain elevators out of these organizations as opposed to general wheat elevators. Do you understand what I am talking about? Let us keep those better wheats separate, let us market those separate, let us get that premium money if it is there.

Mr. PHILLIPS. I do not disagree with what you are saying, I would just take it one step further to say that all that is going on in the industry today is that everyone, whether you are a farmer or a handler, exporter, you are responding to the economic signals that are there, and to do what you are suggesting, you are going to have to go in and make some changes along the lines that we are talking about here so that those signals are realigned, so that you can then meet that kind of objective that you have just laid out. It will

not happen just by saying that, well, we are going to have a specialty house and it all goes there. We have to make changes in standards, we have to make changes in our farm program, we have to look at our whole variety of development procedures to meet that objective.

Mr. SWISHER. I go with that, but where does the advantage come? Does it come to the handlers, or does it come to the farmer, or do they split those advantages? Should that lower grade of grain go in to nothing but feed, and that is what they do in Europe, that all goes into feed, it never does show up in the grain market. What I am saying is there needs to become alterations to that grading program so that does not wind up in our market grain as opposed to feed grain.

Mr. PHILLIPS. Right, and that is very much in line with the main findings of our report, is that to have a minimum receivable standard for grain that goes into export, and then developed, a different classification if you will, like Canada, Europe has of a feed wheat category, if you want to produce for that market, you can still do so, be very profitable, but that wheat then stays in those channels for which it has been intended.

Senator DASCHLE. I am going to ask Dave and Mike to come back up to the table at the end of the hearing to allow anyone in the audience who may have a question about the report or some of the comments that they have already made to be able to discuss that a little bit. Thank you Mike and Dave for your excellent testimony. Let us move on to our second panel.

Jerry Hawkins, South Dakota Wheat Growers; Larry Diedrich, the South Dakota Soybean Association; and Scott Ingle, the South Dakota Corn Growers, if the three of those gentlemen would come to the table, we will take their testimony at this time. All of the prepared testimony will be submitted for the official record, and most of the witnesses have already presented their prepared statements. We will certainly accept your prepared statements in any way that you see fit, they will be in the official record if you want to speak informally. But let us begin. Jerry, why don't we start with you, you are at the end of the table.

STATEMENT OF JERRY HAWKINS, SOUTH DAKOTA WHEAT PRODUCER, SOUTH DAKOTA WHEAT COMMISSIONER, MEMBER, BOARD OF DIRECTORS, PIERRE FARMERS ELEVATOR, PIERRE, SD

Mr. HAWKINS. I am Jerry Hawkins, a South Dakota wheat commissioner and a wheat farmer from the Pierre area. I would like to make a few quick comments.

CCC WHEAT

In our past shipments of wheat we have been shipping out of this country, have had a lot of CCC wheat that has been under loan for many years and a lot of this wheat was not in the best of condition. The last shipments we shipped recently, it is newer quality wheat and we are shipping a lot better quality of wheat than we have been in the past.

EDUCATE BUYERS

I believe one of the best approaches to this is educate the buyers. Through the U.S. Wheat Associates and Northern Crops Institute, we are helping the buyers write the kind of contracts they want to help them get the kind of wheat they want. Some other actions regarding the grain standards need to be put in place.

TIGHTEN UP THE CU-SUM

Right now FGIS is proposing to tighten up the CU-SUM loading plan for loading vessels. I believe this will eliminate a lot of the problems we have. FGIS is also studying the possibility of combining dockage and foreign material into one grading factor, and we believe this will really help too.

GRAIN QUALITY ISSUES—MOVE SLOWLY

We need to move slowly and carefully on grain quality issues. Changes need to be brought about, but everyone in the grain business from farmer to exporter has to be able to live with them.

I am afraid that if we legislate clean grain, the farmer will be the one who pays the cleaning bill.

We need to consider the OTA study that was just completed. Some of the findings can probably be put in place and benefit all of us.

Some of our customers cannot afford No. 1 wheat. They want to buy No. 2 wheat and we have to be able to satisfy their needs with a lower quality, if they want it.

Lastly, I think we need to remember that all the wheat delivered by farmers is not No. 1 wheat. I have a chart prepared that shows all the wheat grown in South Dakota, North Dakota, Minnesota, and Montana from 1983 to 1987. It clearly shows that only 60 percent of our total production was No. 1 and 40 percent was No. 2, No. 3, or less.

Senator DASCHLE. That is in South Dakota, Jerry?

Mr. HAWKINS. South Dakota, North Dakota, Minnesota, and Montana.

Senator DASCHLE. Sixty percent of South Dakota wheat was No. 1.

Mr. HAWKINS. That is all the States together.

Senator DASCHLE. All the States.

Mr. HAWKINS. South Dakota, Montana, North Dakota, and Minnesota.

Senator DASCHLE. Do you have a figure for just South Dakota by any chance?

Mr. HAWKINS. No, I do not just for South Dakota.

It was only 60 percent No. 1 wheat, so there was 40 percent that was No. 2, No. 3, or less. How are we going to deal with the 40 percent? The farmers will lose a lot of money if there is not some provision for blending this poorer grade with the No. 1 wheat. We cannot go overboard, but we simply cannot sell 40 percent of our wheat for hog feed and survive as wheat farmers.

Due to the drought in 1988, there was very little No. 1 wheat raised in South Dakota.

With that I thank you for the chance to testify. If you have any questions I will try to answer them.

[The prepared statement of Mr. Hawkins appears at the conclusion of the hearing.]

Senator DASCHLE. Let us move on to Larry. Larry Diedrich.

STATEMENT OF LARRY DIEDRICH, SOYBEAN FARMER, FORMER PRESIDENT, SOUTH DAKOTA SOYBEAN ASSOCIATION, ELKTON, SD

Mr. DIEDRICH. Thank you, Senator, we had a bushel of wheat and a couple of bushels of corn and I did not see any soybean.

I am a soybean farmer from Elkton, South Dakota. I have a few quick comments also.

There are a number of factors that determine the quality of the soybeans, those being foreign material, moisture, and the intrinsic values which include protein, oil and free fatty acid.

As far as cleanliness goes the U.S. soybeans typically contain about 1 percent more foreign material than our Brazilian and Argentine competitors. Why is this occurring?

While farmers sell at about 1 percent limit on foreign matter with discounts of higher values and the contracts we receive from overseas specify 2 percent and 10 percent of those contracts are 3 percent or more foreign material. The Argentine and Brazilian export contracts on the other hand generally specify about 1 percent foreign material. Our system provides an economic incentive to reduce quality by blending rather than maintaining or enhancing quality. A better system may be to reduce the tolerance of foreign material to zero so that we can be penalized accordingly. We would have no incentive to blend in higher foreign material products.

While maintaining a good physical quality is important, I believe the intrinsic factors, which include protein and oil, demand much more of our attention if we are to remain competitive in the world market. The Federal Grain Inspection Service is already doing some work toward that end. Dave spoke to that earlier as far as using oil and protein tests for our exporting starting in September of 1989 that they would be able to do that as requested, and September of 1991 that would be a mandatory procedure.

We feel that will go a long way in offering incentives to improve the intrinsic qualities of soybeans. In regard for a company to be successful it must determine what our customers needs are, to provide a product that satisfies those needs. If they do not, they are out of business, it is as simple as that. Our customers do not simply want soybeans, they want protein and/or oil, and I would suggest that is what we sell them. We are told soybeans in South Dakota, North Dakota, Minnesota are lower in soybean and protein than the rest of the United States and certainly less than our foreign customers. Portugal stated they do not buy soybeans from South Dakota, North Dakota, and Minnesota. If we are truly lower in protein and oil, why would I advocate we go to a system that we would lower protein and oil? Wouldn't we be discounted even more? I guess my answer would be a qualified no. I will explain.

First, our State is already being discounted by the market. We receive up to 15 to 20 cents discount in the market already, this difference comes from the difference in our basis, the difference between our local price and the Chicago price. We are 15 to 20 cents wider than just the transportation costs. This cost is the discount figured in by the market because of our lower protein and oil value. This cost costs our State soybean farmers approximately $10 million or approximately $1,400 per soybean farmer. $1,400 per soybean farmer it will cost us in 1989.

Second, until farmers are given a direct incentive to increase protein and oil, variety selection will continue to be made strictly upon yield without regard to other qualities. Breeders will also continue to neglect protein and oil and will breed entirely on the basis of yield. If this happens I see very little hope in our protein and oil dilemma in South Dakota of improving.

In conclusion I recognize to successfully implement a soybean protein and oil premium/discount system, we have to have equipment that will deliver correct information simply, rapidly, repeatedly, and economically. We talked a little bit about the infrared system in the wheat, that may be a good starting point for the soybean industry.

Senator Daschle, I would like to thank you for this opportunity to present our comments.

[The prepared statement of Mr. Diedrich appears at the conclusion of the hearing.]

Senator DASCHLE. Thank you very much for the excellent testimony. Scott Ingle, South Dakota Corn Growers Association.

STATEMENT OF SCOTT INGLE, SECRETARY, SOUTH DAKOTA CORN GROWERS, PIERRE, SD

Mr. INGLE. What I am going to do is talk about what the National Corn Growers policy is, because that is basically what South Dakota feels as well. After I review that, I want to give a few other comments to go with this too.

The primary purpose of the official U.S. standards for grain should be to describe and certify quality of grain as accurately as practical. They should:

(a) Define uniform and accepted descriptive terms to facilitate trade in grain.

(b) Provide information to aid in determining grain storability.

(c) Promote the retention of the quality of the grains during the marketing process.

(d) Offer end users the best possible information from which to determine end product yield and quality.

(e) Provide the framework necessary for markets to establish grain quality improvement incentives.

In order to achieve these objectives, we support the following actions for export corn:

First, if research indicates no significant adverse impact on any particular segment of the grain marketing structure, the broken corn and foreign material should be separated for grading purposes. A grade determining factor called broken corn would be established with levels set to be consistent with the objective of in-

creasing corn value. For the ease of commerce, a tolerable level of foreign material could be determined with the balance above that point becoming a weight subtraction.

Second, the FGIS, or its designees, should issue an official white certificate only when the grain samples are representative of the entire container being inspected and are collected by approved methods. Corn that cannot be sampled under these conditions should be issued a different color certificate.

Third, we support the research, development, and testing of end use quality characteristics. We support the development of equipment and sampling/testing procedures which will quickly and accurately determine nongrade factors of corn. Nongrade factors include protein, oil and starch as well as other factors including, but not limited to, mycotoxins.

Fourth, we encourage the certification and standardization of testing equipment and testing laboratories for nongrade factors of corn.

Fifth, we support the research and testing of corn varieties and cataloging of new germ plasm to determine ability to produce specific quality characteristics and the development of new varieties with improved quality characteristics.

Sixth and last, we support official U.S. grading law or standards which would make U.S. corn competitive in the world market. I guess I am glad to see FGIS is working on the nonvisible factors that affect the grading of corn, and like I say, we definitely support this to get it so we have some more objective standards to work with so that we can meet what the buyers want.

One of the comments that was made earlier is what are we going to do with all this corn that does not come up to grade? And it affects the wheat market and various other ones. The gentleman here just mentioned 40 percent of our wheat does not meet the No. 1 standard. As far as that relates to the corn market, I am going to let Jeff Broin talk about this some more, but obviously we get No. 4 and No. 5, sample grade corn. This is a product that works for dry milling and ethanol purposes. This is one way we can keep that substandard corn out of the market so it does not enter the export channels. I think this is one of the reasons where we have domestic programs we can encourage. Ethanol offers a side benefit where we can increase our export quality as well, so there is a lot of things to evaluate here, but it really looks good from that standpoint.

The second one being wet millers cannot produce this kind of corn, so they, if they are producing fructose and products like this, No. 1 is the product they want. So it is important we have good standards and available quality corn for our domestic users as well. So we have two extremes. We have No. 1 for the wet millers and we have some of the worst corn on the market going into the dry millers with the No. 2 corn being available for not only export but for our local feed consumption as well.

With that, I guess I will stop. If there are any questions I would be glad to handle that.

Senator DASCHLE. Thank you Scott. Jerry let me see if I understand the Wheat Growers position. I think I understand what Larry and Scott said about a willingness to accept, not only a willingness, but supporting higher standards in certain categories.

Would the Wheat Growers support stiffer standards with regard to grading and blending for the export market?

Mr. HAWKINS. Well, right now the market in Pierre yesterday, the best I can explain it, was $4.05 for any protein wheat. There is no incentive to produce the quality wheat. If there is an incentive there, we can produce it, but we simply cannot produce it for nothing. Like the gentleman said, I cannot remember which one, but the higher yielding wheats will not be the quality of wheats as the lower yielding ones, and we have to have that yield. He says it is like for the target price, but in my case that is not true. A third of the acres I farm I will hit the $50,000 limit, so the acres I farm over the limit I have to have yield, the maximum yield I can get on those acres.

Senator DASCHLE. Larry has suggested that the Soybean Growers would support zero tolerance on foreign material and a prohibition on blending. Would the Corn Growers and Wheat Growers support that?

Mr. INGLE. As the Corn Growers, I do not know if the zero tolerance would be the proper thing. I cannot say for sure, I think that is something that is under study, and I say there are so many factors that enter into the competition in the corn market that I do not know if zero tolerance is right to focus on now.

Senator DASCHLE. Jerry.

Mr. HAWKINS. For zero tolerance, I would say for my own personal thing, probably not.

Senator DASCHLE. You mean speaking for yourself?

Mr. HAWKINS. For myself.

Senator DASCHLE. Let me ask this then. Would Wheat Growers, Corn Growers and Soybean Growers support minimum standards beneath which grain could not be sold for export as was indicated is the position held by every other grain exporting country? Is that a position that could be supported by these organizations?

Mr. HAWKINS. There is one thing I pointed out, like the weather has, like the weather can ruin the quality of our wheat. We estimate 60 pounds, wheat last year was 55, 56 pound wheat due to the weather, we have to have some tolerance there for that. We have in South Dakota alone over 30 varieties of Winter wheat. In Canada, there is about 5 varieties of wheat. So we have a lot of difference there in variation.

Senator DASCHLE. I am not talking about variation, I understand that, I am saying would the Wheat Growers in your case be willing to set a certain minimum standard whereby anything which failed to meet that standard would not be eligible for export?

Mr. HAWKINS. I do not think so.

Senator DASCHLE. Larry.

Mr. DIEDRICH. I guess I would probably not like to comment truly on that either, Tom. We do have some problems; like what happened in the Southeast where they were flooded out a couple of years ago where there was a tremendous amount of soybeans that were blended off because of people that were already under economic pressure because they were being flooded out, did not have much for a yield, then all of the sudden you are putting on a situation where they would get absolutely nothing for those soybeans

also, so I think it is something to look at and see if it is economical for the U.S. farmer as a whole to be able to do this.

Mr. INGLE. I cannot tell you what the official Corn Growers policy would be, but as an individual I think the minimum standards has merit. I say we have a lot of alternative. Substandard, whether it is our own domestic feed use or in dry milling, I do not think it exhibits as much of a problem domestically for corn producers than it would for wheat and beans.

Senator DASCHLE. One last question and I will let you go. The bottom line in this report is, as Dr. Phillips says, is that quality is the Achilles' heel in U.S. exports today. What do you think we ought to do to address what has now been described as the Achilles' heel in U.S. export quality? How can we overcome what is a fairly substantial handicap in the international market today to address that problem?

Mr. HAWKINS. Well, I think if we educate our buyers it is going to really help considerably. Like I say, if they want No. 1 wheat, they can get it, but like your developing countries, Third World countries, a lot of them will just tender for No. 2 wheat, they really cannot afford to pay that premium.

Senator DASCHLE. So in other words, you are saying just make sure they understand what they are getting before they buy it?

Mr. HAWKINS. That is right.

Senator DASCHLE. Larry.

Mr. DIEDRICH. From my understanding of the soybeans, quality problems on foreign materials, we have to separate those things out when you talk about quality. In soybeans there is foreign material and the other part is protein and oil. From my understanding the foreign material problems are not that large in the soybean business. People from FGIS may argue with that, but we do need to test for foreign material before we do anything in that respect. For the United States to be competitive we have to test for oil and protein and start paying on those intrinsic values. If we do not, we are not going to get very far.

Senator DASCHLE. In other words, put more emphasis on genetics to produce more protein and oil.

Mr. DIEDRICH. The emphasis will come if we demand protein and oil, those capabilities are there and they are working in that direction, but until a value is put on that, how hard do you work at it.

Senator DASCHLE. Scott.

Mr. INGLE. I think part of it, like it has been mentioned earlier, is making the customer more aware of what he is buying. I guess as an individual I have this nagging feeling in the back of my mind that if Argentina is delivering No. 1 corn and they are coming to the United States and just specing No. 2 or 3 and that is what they are getting, can we be competitive with Argentina on No. 1?

On a one-to-one basis I know we can do it on quality, but the question is can we do it on price? And for the No. 2 and No. 3 grade to be competitive in this market, I do not have those answers and I think it would have to have some definite research and have a lot of economic impacts. If we try to create ourselves as No. 1 only, maybe we are going to force ourselves out of the market. I do not think there is that much minimum standard for the corn that goes in, I think that has merit, a lot more merit than going to mar-

keting boards and more restrictive regulations and a lot of other things. I think this way it might send enough signals back that it might give some incentives, I do not know, that is just a personal observation on that one.

Senator DASCHLE. I want to thank all three of you for your testimony this morning, and if it is possible I would like to ask that you stay around for questions that may come up from the audience in a little while. Let me excuse the second panel and ask the third panel to come before us at this time.

Arnie Hofer is the manager and our host this morning, I would like to ask Arnie to come to the table. Dennis Wendland is the vice president for grain marketing for Harvest States and Jeff Broin of Broin Enterprises.

I would like all three witnesses to come and be seated at this time. I know everybody is just as warm as toast now. We are just about ready to take our third layer off.

Arnie, thank you very much for having us. Tell us what we have in the room here. I see a lot of sacks of something. I am just curious, what have you got stored in this room?

Mr. HOFER. What better background can we have than a co-op feedback, it is not that cold, we have a couple of birds chirping here, we are getting them warmed up.

Senator DASCHLE. I have been watching the birds and I have been lucky they are not swooping over head. [Laughter.]

Mr. HOFER. We are not as fortunate to have a hat on like some of these do.

Senator DASCHLE. We are real pleased to have you here as our host, why don't you proceed with your testimony.

STATEMENT OF ARNIE HOFER, MANAGER, SOUTH DAKOTA WHEAT GROWERS ASSOCIATION ELEVATOR, HURON, SD

Mr. HOFER. I would like to mention a few things from the elevator standpoint of how we handle the grain and what we look at and maybe some things from the farmer level we can improve on.

First of all, I guess, not to promote any products but we need to look at our seed first of all, coming in to that season, need to look at the seed and maybe possibly a few seed treatments at planting.

Next of all, jumping to harvest, I see a lot of it with the, taking the dockages and everything with the shrunken and broken kernels, you know, we need to really keep those combines set so we eliminate a lot of them broken kernels, especially when you get a lot of those milling quality grains.

Next thing we have is in the drying procedures. We need to stop and look at the moisture, if you can, if you plan on putting them in to storage, dry it accordingly, and if you are looking at going directly to the market like to us here, the moisture can be a couple percent more and it is just a little bit better to handle at that moisture level.

Next getting back to that story, we need to put that grain in the bin in a certain moisture and possibly maybe grain, putting the grain treatment in there to keep it a comfortable level. Once it is there, we need to keep a watch on those bin tops and clean out those bins. You know, a lot of people think if there is a few kernels

here and there, and in the truckload samples, when you switch from commodity to commodity throughout the day, you need to maybe possibly keep those trucks and combines a little cleaner in those procedures. We just need to really look at a lot of those factors right there to keep more money in your pocket and keep the losses at a minimum there. I guess that I have a couple of samples here in the front, if you have seen a few articles in the paper on the Red corn issue. I guess from right now the local level, as far as handling some of those Red corns at harvest, I guess the way I see it now, could probably be a little difficult. We really do not have the room to keep them separate, so you might want to take a look at that. That commodity at planting, probably because of the export, we will probably get into it, if you have a few questions about that we will have a few people here to answer that issue.

And the infested grain, the way I see that coming up here in the future, first of all once you do have that problem you are going to have to treat it, probably clean it, because you will not be able to have a live or a dead weevil in the grain, and then after that procedure is done you are going to have to probably bring me a sample and get it graded and see if it is possible for even shipment, and I guess the way we kind of see that, it is going to probably be put into a feed category and be sold as such. Just to put everything, we need to keep our grain flowing to the flour mills and for exports.

With that I would like to thank you for the opportunity, and I would like to introduce Keith Hainy. Keith is the grain division manager with the South Dakota Wheat Growers and deals with our markets every day.

Senator DASCHLE. Keith, we are real pleased you could be with us today as well, thank you. Along with Dennis Wendland is Arnie Suhr with Harvest States as well, he is from Aberdeen. Dennis please proceed.

STATEMENT OF DENNIS WENDLAND, VICE PRESIDENT, GRAIN MARKETING, HARVEST STATES COOPERATIVES, ST. PAUL, MN

Mr. WENDLAND. Good to be here today. It is a little cool, I wish I would have known we would be here I could have put my boots on today.

I am here representing Harvest States Cooperatives. Harvest States is a farmer-owned cooperative that serves and works with about 200,000 farmers between here and the Portland area, basically in the upper tier of States.

On the export side of it, I mean that is what we are talking about. Keep in mind we have three points where we are exporting grain from: through the Gulf, we do not have a elevator down there, we put it through some other people, the main one would be at Duluth/Superior, we have a large facility at Superior, Wisconsin in which we export grain out of there and also Kalama, Washington, a facility on the ocean out there on the Columbia River and we export grain out of there. So I will try to address the questions you may have on the export side of it.

Couple of things I would like to talk about some of the other guys have covered. We have seen improvements in the grain quality standards such as dockage to the nearest tenth, protein on a

percent moisture basis and a lot of the other factors, I will pass on that right now. One thing I want you to remember is the quality is not the No. 1 issue with every importing country. A lot of them have different standards they want and is one of the things you look at if somebody is a credit buyer. In other words, getting a good GSM–101 or a Public Law 480 or getting some kind of outright dollars from the United States is looking at quantity of grain not quality as their No. 1 issue. First is quantity; second is quality; and third is service for most of those people. The guy paying cash is more of a quality buyer in what he is looking at. I will give you a couple of examples.

I would say three-quarters of it is going to the Japanese market and being sold as No. 3 Yellow corn. You can look at it two ways. We have No. 2 Yellow at 3 cents better or 2 cents corn at a 2 cent, Japanese want to take the No. 3 Yellow corn with a 2 cent on it, but a typical spread of 3 versus 2 is 2 cents, what they want the grain for is their intrinsic value is feed, typically the reason with grade 3 is because of broken up corn which is still quality corn. In their case if we try to tighten up the standards they are very happy with what they are getting in general. What they asked for they get without question. If they asked for 3, that is probably what they are going to get on the outbound, or better, and they aren't going to get worse than that quality.

Couple of other ones on the wheat side would be Duluth/Superior is the Norwegians and Finland. Finland last fall asked us to spec low 2 and the one specification we want it to be is one-half a percent dockage or less. Export side of it is typical grain that moves to Duluth/Superior is about 1 to 1¼ percent dockage coming from the farm to the elevators and whoever.

Now most of you farmers say, well, my grain is a heck of a lot lower in dockage and my dad says the same thing and my brother does. Just remember, not all farmers take care of their grain, depends on how they set the combines and how much comes in. Typically what comes into the port of Duluth/Superior would average highly over 1 percent on the dockage side. You take the case of Finland and Norway that wants a half percent of dockage, you need to clean or segregate and keep those qualities separate so you have a half percent dockage full bins for loading on that ship. They do request and are getting what they ask for. Sweden, Norway, and Finland are asking and getting those specs. Algeria, they want Durham 3, they are not specifying they want dockage below one-half percent or something like that.

I think one of the biggest things we have to remember when we are talking about or when you hear dirty wheat or dirty grain or whatever, I guess I hate that connotation, but the difference is the amount of dockage or broken up kernels or pigeon grass or whatever is in there, is so that you understand it, is just brought along, put up on U.S. Wheat Council and this is grain going to Japan off the west coast and this is Spring wheat and I think it goes for most of the grades, but dockage going to Japan last year averaged about eight-tenths of a percent on dockage, their specifications in the past have never limited how much dockage could go on a wheat vessel. They are going to start June 1 in saying any Spring wheat and Durham is going to have to have a max 1 percent dockage and

Winter wheat, and on White wheat it is going to be eight-tenths. They are starting to tighten a little bit, but they are unwilling to do what another country has done, and that is Taiwan.

Taiwan says you will not load any dockage in that vessel. If you do, not only will we deduct it from the total, we will also give you a cash penalty besides that. And in the case of Taiwan the average dockage going off the west coast this past year was six-tenths of a percent, about three-tenths below what the Japanese are getting, again they are willing to pay for it and make a penalty and that penalty goes to the exporter and that goes back to you and the farmers and the people who own Harvest States.

Senator DASCHLE. Is that dockage and foreign material or just dockage?

Mr. WENDLAND. Dockage.

Senator DASCHLE. For the record and clarification of those that may not know the subtle distinction between dockage and foreign material, do you want to take a shot at defining your terms?

Mr. WENDLAND. I can try. I will turn it over to Dave. Dockage would be anything that would fall through a 5/64 screen I believe is considered dockage, and FM would be, I am going to pass on that, but——

Senator DASCHLE. Dave, would you mind?

Mr. ORR. The way I try to describe dockage to people is dockage would be anything that is appreciably larger than wheat, can be removed by air which would include dust, and anything appreciably smaller than wheat. We use a machine to make that determination.

Senator DASCHLE. So it is a size criteria, bigger than wheat is foreign material, smaller is dockage.

Mr. ORR. No, I am defining dockage. For dockage we have a machine that basically makes the separations. It removes anything larger than wheat with a scalper, it uses aspiration to remove dust, and a screen to remove sand, dirt, and material appreciably smaller than wheat. Those three separations are added together and that is what is considered dockage.

Senator DASCHLE. So dockage can include foreign material?

Mr. ORR. That is correct.

Senator DASCHLE. Dockage is not a specific kind of foreign material, it is basically the term applied to all foreign material even though when considering quality there is a dockage category and a foreign material category?

Mr. ORR. That is correct. Under the standards, foreign material as applied as a grading factor is any material left in the wheat after we have cleaned it to take out the dockage. So in most instances you are finding something about the same size as a kernel of wheat, pieces of corn or kernels of rye.Those are the basic definitions we are using.

Mr. WENDLAND. To go on with that, to compare what the U.S. industries are shipping to Japan, remember Japan is classifying 1 percent dockage the max as of June 30, we have had no specs in the past. When we compare at that time with Canadian wheat and Australian wheat, they run two-tenths and three-tenths dockage. When you say dirty wheat I wish they would classify and say dockage in the wheat, pigeon grass and small particles of the grain that

is in there is screened out, it gets down to the screen facilities we have in the United States versus what they have. In Canada, they have extensive dollars spent on the export side, they have cylinder mills versus diamond screeners and sieve mills we have around here, and we do have some cylinder mills, but that is specifically what they use on the export side and they do a lot of cleaning up there. Part of it is to compete with those guys that is the difference in it.

When you compare damage on the out bound, I do not think that is a problem, I think they report it was half a percent on the average damage to Japan and I think the average from Canada was three-tenths. Damage difference is not there. If you compare FM, compare dockage and GF and E, you clean it like Canada does, you are going to solve and bring down those problems. So what is my answer to that or my question, to that is: why don't the foreign buyer specify more like Finland does and Norway does saying what they want for specifications? One other one is an example of that is Taiwan, they say nothing is deductible on dockage and there is no, zero is the limit. If you put it in there, we are not only going to take a half percent dockage, we are going to double the cost to you. So they put an incentive in your clause to say you will ship clean wheat and I think that helped a lot on it.

One of the problems on that is that foreign buyers, specially Japan have their own political problems and they do not want to solve the problem themselves and say we want dockage at five-tenths or six-tenths or seven-tenths at this point in time, they are saying it is your problem, you guys solve it. You guys come up with the same type of grain that Canada does and Australia does so they do not want to address the problem directly themselves either by asking for that grain, but I can guarantee you the whole grain trade is very efficient. They ask for half a percent dockage or 4 percent dockage, they will get what they asked for and get what they paid for.

The biggest problem we have is no financial incentive for you all, the farmer, the elevator manager or us as a terminal operator to clean the wheat down any further than it is today because they are not going to give any premiums for you to do that. It is costly and you are losing some of your wheat, so the financial incentive has to come from the buyer who is willing to pay a little premium. Thank you.

STATEMENT OF JEFFREY S. BROIN, MANAGER, BROIN ENTERPRISES, INC., ETHANOL PLANT, SCOTLAND, SD

Mr. BROIN. Good morning, Mr. Chairman, members of the committee, I appreciate this opportunity to discuss the topic of grain quality. My name is Jeff Broin, I am the manager of Broin Enterprises. We currently operate the only ethanol plant in the State of South Dakota.

I am here today to explain to you an alternative use for distressed grain in local areas. Maybe not specifically as to wheat, but rather specifically corn, milo, and barley. Ethanol can be made out of anything that contains starch, and wheat is one of those. There are not a lot of wheat plants in the United States right now, I do

not have a number on that, but it also can be made out of wheat. I guess I will just go on and read some of my testimony here.

FAMILY PURCHASED ETHANOL FACILITY

My family purchased the bankrupt Scotland ethanol facility in 1987, after successfully operating a smaller facility in Minnesota for 3 years. The Scotland facility underwent major renovations before its startup in July of 1988. I am happy to report the plant is online and at 100 percent capacity at this time. South Dakota has proven to be an excellent business atmosphere, and local and State support has been outstanding.

ETHANOL PRODUCTION

Ethanol production is the enzymatic conversion of the starch content in grain to sugar, which in turn can be converted to alcohol by fermentation. This process produces an 11 percent grain beer. The alcohol content of the mixture is then distilled out of the beer, producing approximately 2.5 gallons of ethanol per bushel of corn—that is variable depending on the feedstuff. The remaining portion of the beer is then separated by a centrifuge process into distillers grain, a 30 percent solids high quality feed; and sweet water, a high quality liquid feed. The two feed products are averaging approximately 35 percent protein on a dry matter basis, and are also very high in energy, fat, and micronutrients.

Ethanol production, as a fuel industry, is also currently experiencing increased potential for demand due to Federal clean air standards and the potential for ethanol blended fuels to help cities meet these standards. The use of ethanol blended fuel can reduce carbon monoxide emissions from automobiles from 15 to 33 percent. New technology is also playing a big part within the current ethanol industry. American Eagle Fuels, who sort of asked me to speak for them today, is an ethanol production and research company, is currently testing a new bacteria technically named Xymomonous mobilus, that has the potential to replace yeast in the fermentation process. This bacteria has shown slightly increased yields of ethanol per bushel of grain, as well as a more pure grade of ethanol and slightly more advantageous feed products. The same company is also researching the production of ethyl tertiary butyl ether, more commonly known as ETBE. The combination of other products with ethanol produces a pipeline fungible fuel that seems to be a much superior product when compared to MTBE, an octane enhancer currently used in many fuels. MTBE contains methanol, a natural gas derivative that the United States is currently importing.

GRAIN QUALITY IS IMPORTANT

The importance of grain quality also plays a major role in the ethanol industry. Grain quality is very relevant to the operation of our ethanol plant, as well as other ethanol plants throughout the United States. Heat and insect damaged grain, as well as grain with foreign odors, make up approximately 80 percent of the grain processed into ethanol at our facility. Despite discoloration and other damage, the poor quality grain will produce a high percent-

age of the ethanol available from No. 2 grain. The feed coproducts available at our ethanol plant have been tested extensively, and also have little or no change in value relative to the grain quality. The fact that ethanol production from distressed grain has little impact on normal operations allows an ethanol facility to pay a higher price than most grain handlers for this low quality grain, while turning it in to high quality, sterilized feed products. The feed products also are enhanced by the cooking of the original beer, which creates a 60 percent bypass protein from the Browning effect; and also by the predigestion of the fat content of the grain in the production process, allowing a ruminant to digest up to six times as much of the end product fat.

END RESULT

The end result is the production of ethanol and high quality protein feed from low quality grain. The feasibility of this process not only helps the producer receive a higher price for distressed grain, but also helps ethanol production costs in the long run. I feel a large percentage of the low quality grain in the United States should be used to produce a fuel source that not only helps reduce our dependence on imported oil, but that also aids the domestic producer in grain prices and provides a high quality feed product for cattle feeders. The net result of this is cleaner grain exports, and a reduction in the overall national problem of grain quality.

Thank you.

[The prepared statement of Mr. Broin appears at the conclusion of the hearing.]

Senator DASCHLE. Jeff, thank you. Who are you selling your ethanol to at this time?

Mr. BROIN. Most of it goes into Sioux Falls and Mitchell. We are the only plant, we produce one-sixth of the State's demand.

Senator DASCHLE. You produce one-sixth of the State's demand and it goes to petroleum distributors?

Mr. BROIN. Right, it goes to fuel blenders who mix the alcohol with the gasoline.

Senator DASCHLE. The blenders are here in South Dakota?

Mr. BROIN. Sure, Sioux Falls, Mitchell, that is where it all ends up.

Senator DASCHLE. Thank you very much, Jeff.

Arnie and Dennis both, we have now seen the Grain Quality Improvement Act in effect for 2 years. Do you see either locally or regionally from your perspective a significant change in the way grain is handled as a result of that act being passed?

Mr. HOFER. We are taking a serious look at it with the weevil, insect damaged kernels, IDK, we have to specify a percent of damage and after a certain point it has to go into a feedbin and be sold as such, we are more or less getting started on that.

Mr. WENDLAND. On the export side we have to get the sweepings off the bin back into the bin, all the different factors have definitely been big in the export side of it that we have to look at, and I think they have been very effective in cleaning up a lot of the problems in them acts we have had. As a farmer owned cooperative, we do want to do and follow the rules and the laws, and it

actually helps us because the people we are competing with are the private trade, they are exporting grain and it makes them stay in line with things we have all read been trying to accomplish in the past, so I think it has been a real positive move that way.

Senator DASCHLE. Let me ask you this. One of the complaints I get as I travel around South Dakota is the number of times the Government itself moves the grain. We are now going to be calling in grain here pretty soon again and I was just down in Mitchell yesterday, and they said they are not sure they know where they are going to put the grain once they call it in. They are going to have to move it and probably move it again and again. Obviously if you look at the general flow of grain from the farm through the system, each time you handle that grain, as has been said this morning and as we have talked about privately, we are detrimentally affecting that grain. Do you think the Government itself is in part responsible for the lack of adequate quality because of the number of times we move that grain, and could the Government have an affect by not moving the grain as often as it does?

Mr. WENDLAND. I do not think that is that big of a problem. I think we have seen some movement of grain between elevators and because of some of these problems we have had the last couple of years and the high amount of storage in place, and I do not foresee that happening today with the low Government storage we have available. So most of it is going from the farm to the elevator and direct to the final destination in general. The only difference in that is that a lot of grain may move into, by truck into the Twin Cities, for example, or Duluth, and then the higher quality or the less dockage and lower damage is moved off to the milling industry so they have some reloading there, but in general I do not see it as a major problem. It has been very minimal in my opinion.

Senator DASCHLE. Arnie, any comment?

Mr. HOFER. I guess from the local level, I guess sometimes moving that grain does assure you of a good quality grain just to have the confidence it is a good quality and I guess from our facility it is kind of nice to have it moved so you have room for local harvest at harvest time.

Senator DASCHLE. Do you think the Government programs bring about the sale of older grain to other countries simply because we have the Government programs that we have set up? We have 5-, 6-year-old grain stored and in part someone would say that is because we have a farm program that encourages grain storage, multi-year grain storage. Is that a detrimental aspect of our farm program from a competitive point of view?

Mr. WENDLAND. I really do not think, again the industry is very efficient from the farmer to the elevator as to the exporter as far as giving them what they are asking for. If you are saying we are going to move grain out of South Dakota and export it, whatever, that grain moves through the channels and is basically interspersed into the different channels, and so you really do not have it IP'd per se, or identity preserved, that is going on the export side of it.

Again the industry is so efficient, the one thing I would point out and from Government inspection numbers themselves, but in 1987 our average damage going out on a 2 grade allowable by your grain

standards is 4 percent damage, the average going out in 1987 was 1.1 percent damage on all exports of Hard Red Winter wheat. On Spring wheat it was 1.1 percent also on damage. So you are looking at the damage side of it and it is one of your quality aspects is the damage, and that does not appear to be a problem at all when you look at that. Again, the problem comes down at the dockage and S&B and FM and it really gets down to the difference I see, and the screening they do in Canada and Australia and we do not do here, again it is going to be who is going to take the financial responsibility that way of cleaning it and when it calls for cleaning and the loss of grain you are going to have out of it.

Senator DASCHLE. Dennis, let me ask you what I asked the last panel. Do you think Harvest States would support a minimum beneath which grain could not be exported?

Mr. WENDLAND. I am not prepared to answer that question, we have Phil Testerman from our board, who is a farmer from South Dakota, and the reason it is far reaching and when you get down to it, you basically are going to say is we are willing to say that if your sample grade or whatever that has to go into an alternative market, the discounts for those grains are going to be substandard and our farmer-owners are going to bear the brunt on that, and the farmers in general are—that is something I could not answer as an employee of the company. In general I would say the testimony is not a problem on the outbound. So again where is the problem in the exports? I do not believe it is in damage which is the No. 1 quality that will put in sample grade. Second one is infested, we are going to say infested grain, if you cannot sell infested grain out of the export, we are really going to run a lot of grain out of that potential. So damaged, if we say that, I do not believe that is a problem.

Senator DASCHLE. Thank you Dennis, thank you panel members. At this time I am going to ask if anyone who has come here today and wants to express themselves, I see Dallas Tonsager. Dallas, the South Dakota Farmers Union president, I would like him and anyone else. Panel you are excused, you are welcome to leave. What I would like to do, Betsy, let us set up the microphone. Dallas, let us have you come up first. I happen to know Dallas personally, but if each witness could come up and give their name, their organization if they are identified with one, and their hometown, and then present their testimony.

OPEN MICROPHONE TESTIMONY

STATEMENT OF DALLAS TONSAGER, PRESIDENT, SOUTH DAKOTA FARMERS UNION, HURON, SD

Mr. TONSAGER. Thank you Senator. My name is Dallas Tonsager, president of South Dakota Farmers Union. I want to comment on four points.

One, I think the potential of minimum grain standards for exports has a lot of merit and I think we need to look at that a lot more, because that maybe what it comes down to doing.

Second, talking about the farm program in general, how it impacts, the total overall quality picture, and you just asked a few seconds ago about the fact that we have grain sitting out there for

5 or 6 years, I think that is a very important issue in the overall quality problem, because if you take livestock, for example, every livestock feeder and every hog feeder knows that if they let their hogs stay on the farm too long they are going to get over fat and the quality goes down, and if the whole market does that then the whole structure of the pricing system goes down.

We have to build in the next farm program rapid rotation of the grains, and there is no reason not to, there is no reason to have grain out there that is 6 or 7 years old. I think that has been a serious impact on the overall quality problem for the last 4 or 5 years, and I think that is one of the key elements of this.

Third, some other gentleman mentioned premium is on protein of wheat and the fact there was no premium protein on wheat right now and no incentive to do it, on the other hand within the last year there was a premium protein on wheat of almost 40 cents a point. It varies all the time, it jumps up and down, there is no consistency to it. Farmers cannot plan on that premium for that commodity, so they do not go out and seek out the highest protein wheats, they look for the highest yields.

And that leads me to the fourth point, and that is the farmer program focuses on maximization of production and not maximization of quality, and I think we have to focus on that.

Senator DASCHLE. The last point was one of the major points brought out in the study itself and I am glad to hear you confirm that from your point of view. Thank you for your comments. Is there another witness?

STATEMENT OF LARRY JONES, NORWEST CORPORATION, SIOUX FALLS, SD

Mr. JONES. I am Larry Jones, and I currently work for Norwest Banks. I am a former loan officer for the Omaha Bank for Cooperatives, and would like to develop a scenario that existed in the early eighties. We observed in visiting with our managers across the four State district, including Wyoming, South Dakota, Nebraska, and Iowa, that multinational grain corporations which probably, well they are multinational, have headquarters in many of the exporting nations of the world and our co-ops were locked to the mainland of the United States. What our managers were seeing happen is, if producers had high quality grain for sale they took it to the multinational grain company elevator and were provided a premium. If they had a substandard product, they would go to their local co-op and demand an equal price that was being paid down the road at the multinational grain corporation.

The board of directors of the co-ops, being farmers, would say: why aren't you paying up for the grain that is being delivered? So the co-op was being destroyed by the very members of that co-op, and the co-ops being locked to the United States, did not have a market for their substandard grain. I am a strong supporter of minimum standards, because as the discussion has developed here, that is if I heard it correctly, and if it is the truth, other countries have established specific standards. If we do not have them, we are the dumping ground. I mean if Japan wants lower quality, and through Government programs we support our farmer, I mean we

support the farm price through support levels, but foreign grain buyers can come to the United States and get their poor quality because they want quantity, they cannot go to Australia, they cannot go to Canada, so in the end multinational grain corporations that have offices all over the world, are sitting around a table like this and saying what quality do you want, and the guy says I want a poorer quality, but I want a lot of it, where are they going to go. The guy with the multinational grain corporation is going to say, well, I can get you that out of the United States. Can't get you that out of Canada, cannot get it for you out of Australia, but I can get it for you in the U.S.A.

So I am a strong supporter of those kind of standards, and I agree with Scott Ingle and Jeff Broin that we just have to develop alternative markets for lower quality grains. We are going to produce them, and we are going to have them, but we must have alternative markets for them, and we just cannot, we cannot, through Government programs, support higher prices for the farmer just so that he can continue to be incented to produce lower quality stuff. And that is the testimony I give.

Senator DASCHLE. Larry, it is excellent testimony, thank you, you make a lot of sense. Next.

STATEMENT OF ROD HALL, FARMER, FULTON, SD

Mr. HALL. Rod Hall. I am Rod Hall a farmer from Fulton, South Dakota.

One of the first things I would like to comment on would be the comment that was made by Secretary Swisher that it appears that the grain dealers are being a little more honest. I do not think that is half enough, that is like saying they are not quite completely pregnant. I want my grain dealer to be honest, period. No if's, and's, or but's about it.

I just finished delivering 15,000 bushels of milo to the elevator at Emery. I trust that they weigh it correctly, I trust that they pay me correctly. I do not want them to say that, well, he is getting more honest today or tomorrow.

The comment was made about the length grain has been in storage. I do not think it is how long it has been in storage, I think it is how you take care of it while it has been in storage. The milo that I have delivered yesterday and today was grown in 1981, and this is 1989. So you talk about 5 or 6 years, I am talking about 8 years, Senator. Back in about 1983, I moved it from one bin to another, they sent a sample in, and they said it smelled bad. Everybody else that had samples sent in also smelled bad. And so we wondered how they tested at this time. Well, they said the guy that smelled it had a bad cold that day and it had been sitting there a long time, so they sent it to Sioux City. The report came back that it smelled good there and so they put it in reseal and we kept it for a bunch more years and it is turning out to be just real fine milo, they are glad to buy it.

I was glad to hear mention that they are making some attempt to test the odors of grain with something a little more dependable than somebody's nose. I think this is an improvement that can and should be made. As far as the poor quality grain, and we in South

Dakota will tend to produce this from time to time. It is something, be it wheat or milo or anything else, or be it corn, and I have a Garst jacket on now, and sometimes you want more bushels and you will get lighter grain. If we choose to produce this, this should have to go into the feedline, or it should have to go into ethanol production. It should not be made to go into the product that is going to be for export for human food or something like that.

And the final comment I would make, I have this paper this morning, "Pro Farmer," and I was reading where Cooper Evans, President Bush's adviser is using a number of 50 percent cracked soybeans, 10 percent other grain, 40 percent dirt, and that can be sold in America. I think Cooper Evans is not a wild-eyed liberal from Massachusetts or from somewhere else, I think he is a good, down-to-earth farmer from Iowa, and he is just utterly disgusted with some of the trash that is being sold in the market, and we need to bring a halt to it. With automobiles when they did not have quality, they did not, they just did not sell. Make a quality product, you will sell them, and I guess I would summarize it by saying that this is a problem that has come to us in the last few years simply because there is such a tremendous number of people that are now in the business of selling grain, not just the very few that were there a few years ago.

If we are going to do this, we have to have an excellent product, we have to work hard, and this is going to be something that is going to take cooperation. We simply cannot do it by ourselves. I think that the agricultural producers are going to have to get together, they are going to have to use every bit of resource they can find, every bit of resource they can generate, and they are going to have to imagine some resources, and for that reason I think it is terribly important for persons that are producing grains of any kind to look at the neighbors, to cooperate with them, and I would certainly urge anybody interested in the production of any kind of feed grains, whether you are going to use it for ethanol, for feeding your hogs and cattle, or for exporting to foreign countries, you should look at the advantages that could be gained from organizations such as the Grain Compact. Do not say no, things will get better, give us another 50 or a 100 years. This is the time for us to act and act now, and I think this is one of the things that is terribly important. We need to cooperate and we need to solve this very quickly. Thank you.

Senator DASCHLE. Thank you very much. I would like to see that quote if I could from Cooper Evans at some point. I think you make a good point. You know, the United States was once the preeminent distributor of automobiles throughout the world, and we lost that market for one reason, that was quality. And I think that is basically what we are talking about here. How do we maintain our market share and at the same time emphasize the importance of quality to do that. Keith.

STATEMENT OF KEITH HAINY, DIVISION MANAGER, SOUTH DAKOTA WHEAT GROWERS, ABERDEEN, SD

Mr. HAINY. I am Keith Hainy with South Dakota Wheat Growers, I am the grain division manager from Aberdeen.

No question about it, I think maybe we have not said it yet, but obviously the reason why we are here is to enhance the economic condition of the farmer. That can be accomplished by the grain standards in two ways:

One, to have higher prices for the producers that raise the good grain.

Two, getting more of the export business so that we can have higher prices because of the higher exports. But I think that we would be making a huge mistake if we did put in total minimum standards going into export facilities.

Like Jerry Hawkins mentioned, not all the wheat is No. 1. And all the poorer quality grain is not just made up at some export house, it comes from someplace. Whether it is low test weight wheat like we have experienced this year, or grain that has gone out of condition, we need to be able to have a market for that and be able to pay the producer as good a price as we possibly can for that grain. So there has to be a market other than feed in order to better enhance the whole producer picture.

Now, I would strongly recommend that maybe we need a super 1 grade of wheat. I think Dennis talked a little bit about it. They are talking more specific specs than just No. 1, for instance, that they want one-half a percent dockage. Maybe we can come up with a grade that would command these higher premiums. Thus when we are out here buying from the producer, if it is something that is going to make that super 1 grade, he gets paid accordingly. If the exporter wants to buy that type of grade, that is what he is going to get. The price is going to dictate that. If he is willing to pay the price for that quality, that is exactly what he is going to get. The United States is free enterprise and price is dictating, there is no question about that. Like Jay mentioned earlier, the reason why countries are getting some of the poorer quality grain than what maybe they would like is because of the price, because they are wanting No. 2 or No. 3 grade and it is because of price. But if we can come up with a standard that would allow for a super quality wheat, that obviously some of the importing countries would like to have, we can furnish it. We can furnish it with price. We already have minimum standard qualities when it comes to IDK. It was mentioned earlier that 32 insect damaged kernels per 100 grams is what is accepted to go into human consumption and in the export business, anything over that is feed, and that is where it is going to go.

Senator DASCHLE. Let me ask you this. We apparently do not rank No. 1 in any one of the standards by which quality is measured. First, does that trouble you? Second, if we were to compete in that higher quality level where we would seek to become No. 1, do you think we can do it at a competitive price?

Mr. HAINY. Well, you have to realize that we are a free enterprise and that Canada is not. The export there is subsidized. Whether or not our Government is willing to spend the money to do that, I do not know. I think the industry can do it in a longer term type of thing with education of the importing countries that this wheat is that much better quality and thus commands that much higher price, and I think that is the route that we have to

go. It is not fair for us in the private industry to have to compete head to head with the subsidized industry, as say Canada.

Senator DASCHLE. Canada, of course, would say, well, you have a target price and you have export enhancement, that looks pretty much like subsidy to us.

Mr. HAINY. Well, it is subsidy to the producer extent and not the grain handling system, and I think there is a difference there.

Senator DASCHLE. EEP is not a grain handling subsidy?

Mr. HAINY. Not to the grain industry, it is to the producer industry and not the grain handling industry. That is the difference that Canada is supporting the clean wheat philosophy by the facilities up there that can clean the wheat to very low dockage levels. We have to do that in private industry right now. We are not paid by the Government to clean this wheat down to five-tenths or two-tenths or whatever. We are not subsidized for doing that, we are not subsidized for anything, really.

Senator DASCHLE. Thank you very much.

Mr. TIMM. Floyd Timm, I would like to ask Mr. Orr where the wood chips, the gravel, and the metal that are reported coming in from, that is in with this grain? I mean we are talking about foreign material. Well, us farmers are not putting it in, where is it coming from?

Mr. ORR. Well, obviously we hear the same comments as we travel around. The incidence of that type of material in grain we have seen go down over the past several years. I think some of the things that have happened through the Grain Quality Improvement Act have made significant improvements in some of those areas. I am not saying they came from the farmer or wherever they came from, but better handling practices, I think, are going to make a difference.

Senator DASCHLE. Dave, weren't you telling me that we had very serious problems with regard to wood chips and other kinds of foreign material prior to 1986, before the Grain Quality Improvement Act, but you have seen a substantial diminution of that kind of material as a result of the act being passed and implemented in 1987 and 1988.

Mr. ORR. I do not think that is quite true, I think the samples we see at export, and we grade every sublot that goes out, are sampled continuously as they are moving to the vessel. We examine about every 30 or 40,000 bushels, and we do not find many instances where you have wood chips, or metal fragments, or something of that nature. If we did in fact find those in our samples, those samples would be called sample grade and the exporter would be in a position of having to remove that from the vessel.

There have been instances where some things have gotten through the system. We have heard complaints of fertilizer being in samples overseas or something like that. Some of that comes from the transportation system. You get a railroad car that hauls fertilizer one way and unloads and backhauls wheat in the other direction. If somebody did not clean that car out between the discharge of the fertilizer and the loading of the wheat, for instance, and it pulls up to the grain elevator, they open up the bottom of the rail car, in it goes and its very difficult to find that. It could go all the way through the system.

So a lot of the instances we have found have been caused from commingling of the commodity in the transportation system, not so much on the part of an export elevator maliciously putting fertilizer or some other stuff in samples. We have had instances where glass balls have gotten overseas, very small glass balls. Again that came from a contamination in a railroad car they had been hauling to a glass plant, somebody did not clean out a railroad car and loaded grain on top of it and it gets into the system that way. So——

Mr. WENDLAND. I wanted to add some of the times we hear about the wood chips, or cement chips, or whatever on the export side. At least in Harvest States we never hear any complaints on the other end. If we do, if there is a problem, in the last 2½ years I know of no vessels that have done that. To be fair, in the private industry I do not think probably the amount of slips is less than one-half a percent, so out of 1,000 ships maybe a couple of them have a problem.

Maybe, basically, where the problem comes from is 2 by 4's come through the elevator, we do not have screens set up in there where it takes out the larger particles, so it gets into the leg and up and through. The samplers are not going to catch those. Where does that come from? It comes from the farm, it comes from the elevator, or guys in the terminal elevator drop wrenches down in the bin, unfortunately that lands some where. Mostly it is not a big problem, but I think they blow that out of proportion that we have those kind of problems.

Senator DASCHLE. Any other questions?

Mr. INGLE. Mr. Orr, one thing I was wondering, we talked about dockage levels, you mentioned they had not really changed, they are like eight-tenths of a percent we heard of some samples. Has the uniformity increased, though? I mean we are talking about an average, how is the variability doing, is that coming down or staying the same?

Mr. ORR. I have not seen any particular study on it, but I do think the variability has been improved. I think going from reporting dockage in whole and half percent to reporting it to the nearest tenths has helped uniformity. Are you addressing uniformity within the vessel, or just across the board?

Mr. INGLE. Across the board and within the vessel both.

Mr. ORR. I think the uniformity within the vessel has gotten better. The change and also some of the tolerances, I think have helped uniformity. I want to go back to what Dennis was talking about when you go across the board. I think a lot of it has to do with what the countries buying the wheat put in their contracts. We do have vessels that go out with over 1 percent dockage. It is per contract. The Taiwanese vessels that go out are going out with limited dockage. So you have to look at it on a country-by-country basis to say across-the-board. But I think the uniformity in the vessels have gotten better.

Senator DASCHLE. Another question. Keith.

Mr. HAINY. I just wanted to make a brief comment that I forgot to make earlier, it was on Larry Diedrich's testimony on soybeans. I think that he was in favor of a zero tolerance on FM, and I guess I would definitely oppose a zero tolerance because all that does is

take money out of the farmer's pocket. That tolerance is money in the producer's pocket. It is roughly 8 cents a bushel right now, and that should not be done. Also I would also have to contradict a little bit about the basis difference in South Dakota due to protein and oil. Roughly 90 percent of our soybeans that we ship out of South Dakota goes to the west coast. Our prices that we sell on are the same prices going to the west coast as Minnesota sells, North Dakota sells, and Nebraska sells, there is no difference in basis because our oil and protein is lower. So I would dispute that comment.

Mr. WENDLAND. I was going to catch Larry afterwards on that. As far as the river markets, the only place we do see a discount on South Dakota soybeans and Minnesota and North Dakota, we do see some of that in the past on barges going down the Gulf. I think the biggest we have seen in the last 5 years is about 2 cents. So basically what happens is we are offering a barge out of our facility in Savage or Winona and they know they are coming out of Minnesota and Dakotas, whatever, they basically say Minnesota or northern, I forget how they call the origins, basically it will be a 1 or 2 cent spread on what they are willing to pay for the more southern grown beans but that has not been the case in the last crop-year for sure, and I think the last 2 years there has been no discounts to my knowledge. If there has been, there has been a 1 cent spread.

Senator DASCHLE. Any other comments. If there are no other comments, we will be around here to talk informally with anybody who wants to stay around. I am sure that Dave and Mike will be here at least for a couple of minutes afterwards if you want to talk to them privately.

I want to again publicly acknowledge what a contribution both of them have made to our hearing this morning, thank Arnie once again and the South Dakota Wheat Growers for hosting us and thank all of you for coming. I have learned a good deal and I think this has been a good discussion. Again I emphasize this is the first subcommittee hearing of the Research and General Legislation Subcommittee and I think it was a very successful one. To all of you my thanks, see you next time.

[Whereupon, the subcommittee adjourned, subject to the call of the Chair.]

[Material submitted for inclusion in the record follows:]

APPENDIX

PREPARED STATEMENT OF JAY C. SWISHER, SECRETARY, SOUTH DAKOTA DEPARTMENT OF AGRICULTURE

I want to thank Senator Daschle for holding a field hearing on the issue of grain quality in the United States. We have all heard horror stories about the quality of U.S. grain, and about some of our foreign customers receiving dirty grain from this country.

According to the stories, our foreign customers have received grain laced with gravel, dust, bits of iron and all sorts of other foreign materials. What they receive is not at all what they contracted for, and the implications are that someone has tampered with their shipment.

The awful details, if they are true, would make you ashamed to be part of the U.S. grain system.

Perhaps there is some shadow of truth to these allegations. An article in March 18, 1989, issue of *Pro Farmer* summarized the publicized study on grain quality by the Office of Technology Assessment (OTA). The study compared the grain handling practices of five export competitors with those of the United States, and came up with three major differences between our export competitors and the United States.

To quote:

1. Competitors take great pains to preserve grain quality from the time it is first brought to market.

2. If they do have to blend to meet customer specifications, competitors make sure the blending is uniform throughout the shipment. Lack of uniform blending is a major complaint of both foreign and domestic buyers of U.S. grain.

3. Minimum quality standards for acceptance into the marketing system at any price are much lower in the United States than among competitors.

Whether there really is a problem with the quality of U.S. grain, as this study suggests, is extremely difficult to judge from here in South Dakota.

However, after digging into the issue of grain quality, I came to the conclusion that many of those "horror stories" deserve to be identified as such. Although we have all heard some of these stories, I am hard-pressed to find any proof to substantiate them. It seems for the most part they tend to be based on a great deal of hearsay, with little or no documentation to back them up

On the other hand, we can document the work of the Federal Grain Inspection Service (FGIS). This agency inspects and certifies the grain that leaves this country. The FGIS also ensures that the official U.S. Grain Standards are enforced in the marketplace.

Last year, for example, the FGIS Inspected 5,473 lots of wheat. When those lots got to their foreign destinations, the FGIS received 34 official complaints. Now 34 out of 5,473 amounts to less than 1 percent of all wheat inspected in 1988.

That does not indicate a significant problem.

Looking further into the issue of grain quality, my research has yielded some interesting points. I asked my staff to contact representatives from the wheat, corn, and soybean industries in the state. The report from all three industries is the same.

The first thing they tell me is that foreign buyers are getting the type of grain specified by their contracts and the type of grain they pay for.

As an example, Betty Hansen, Executive Secretary of the South Dakota Soybean Association, tells about being in Portugal last fall. The grain buyer they were talking to in Portugal pointed out the difference between shipments received from Brazil and the United States. He said that Brazilian beans were better, because Bra-

zil's shipment had 1 percent foreign matter while the United States' had 2 percent foreign matter.

Then Betty asked him what he had contracted for. After hedging a bit, the buyer finally said that he had specified 1 percent F.M. from Brazil, and had specified 2 percent F.M. from the United States, because of the cost savings.

He got what he contracted for. If he issued a contract for 1 percent F.M. from the United States, he undoubtedly would have received 1 percent F.M. grain.

The same is true in other grains. I feel that many of our foreign customers buy simply on price. For the prices they are willing and able to pay, they can purchase only No. 2 or No. 3 grain. The No. 1 grain costs more, but few are willing to pay what it's worth.

There are exceptions to this. Some of our foreign grain customers, such as Japan, Taiwan and Korea, are very sophisticated buyers. They write contracts with strict specifications for top-quality grain, and that is what they receive.

This leads me to suggest that the logical answer to the "problem" of grain quality is to help our foreign buyers become better educated about the U.S. grain system.

Just as a good salesperson is there to help educate a buyer about the specific attributes of a product, and how those attributes vary from one product to another, so the United States grain industry should help educate foreign buyers about the attributes of different grades of grain.

We have a complex grain system, but it is a system that seems to serve the industry well. If we help buyers become educated about our system, they will better understand what they want and will be able to write specifications for the type of grain they want and need.

I would like to conclude with the observation that the "problem" of grain quality today—if, indeed, there is a problem—is nothing compared to what it was in the 1970's.

The grain industry should be commended for taking the initiative over recent years to clean up their own act. There have been major improvements in the grain standards, and there continues to be improvement. I understand from the Wheat Commission that grain companies are shipping cleaner wheat today than they were even 6 months ago.

As I understand, this tightening of the grain standard has been a cooperative effort of the entire grain industry—everyone from farmers to elevators to grain handlers all working together.

There is no way we will ever completely eliminate the problem, because there is always a chance that something will slip through. However, I feel there have been tremendous improvements recently, and fully expect that trend to continue.

Prepared Statement of Michael J. Phillips, Ph.D

Mr. Chairman and Members of the Committee:

Thank you for inviting the Office of Technology Assessment (OTA) to appear before you today to discuss the findings and policy options from OTA's study on grain quality. I am Dr. Michael Phillips, Project Director of the study. My testimony will focus on an overview of the study's findings and policy options of most interest to farmers and country elevator operators.

BACKGROUND FOR OTA STUDY

The study "Enhancing the Quality of U.S. Grain for International Trade" was requested by Congress because of concerns about the quality of U.S. grain exports. More competitors exist in the international grain market now than ever before and grain quality has become an extremely important competitive factor. In a mere decade, growth in grain suppliers worldwide has been phenomenal. In the 1970's, one-third of the world's countries supplied grain to two-thirds of the world's people. Today, the reverse is true: two-thirds of the world supplies grain to the other third. This competitive environment has made foreign buyers increasingly sensitive about the quality of grain they receive.

Importers of U.S. grain have become more vocal in their concern about quality. Formal complaints to the U.S. Department of Agriculture made by foreign buyers have increased yearly. Examples of specific complaints include: excessive amounts of material other than grain in the shipment; quality attributes, such as wheat protein, not meeting contract specifications; grain (mainly corn and soybeans) arriving out of condition; and grain arriving in broken or cracked condition.

The debate on grain quality in the United States has often focused on the adequacy of today's grain standards, developed over 70 years ago. Critics argue that the

standards themselves are to blame for customer complaints. They claim that standards have not kept pace with the changing world marketplace and are frequently misunderstood by foreign buyers.

While such statements are valid, focusing the grain quality debate solely on standards avoids dealing with other important grain quality problems. Improving quality will require much more complicated actions than just tinkering with the criteria for standards. Grain is vulnerable to quality deterioration at virtually every stage of production. Before deciding on which changes to make tull understanding is needed of the complex, interrelated system of: developing grain varieties, producing grain, harvesting grain, storing grain, handling grain, and testing grain. Understanding these relationships, which make up the grain system, was a main goal of the study.

It is important to clarify what is meant by grain quality. Webster defines quality as an essential character, a degree of excellence, or a distinguishing attribute. In grain, quality has come to mean a variety of things—being free of foreign material, not cracked or spoiled, or having the proper characteristics for a particular end use. No one definition of quality as it relates to grain has been accepted.

OTA defines quality in terms of physical, sanitary, and intrinsic characteristics.

- *Physical quality* characteristics are associated with outward visible appearance of the kernel or measurement of the kernel. Included are kernel size, shape and color, moisture, damage, and density.
- *Sanitary quality* characteristics refer to the cleanliness of the grain. They include the presence of foreign material, dust, broken grain, rodent excreta, insects, residues, fungal infection, and nonmillable materials. These are characteristics that detract from overall grain value.
- *Intrinsic quality* characteristics are critical to the end use of the grain. They are nonvisual and can only be determined by analytical tests. In wheat, for example, such characteristics refer to protein, ash, and gluten content. The characteristics depend on the grain and the end use within a grade.

MAJOR FINDINGS FROM OTA STUDY

A key component of the OTA study was to compare the U.S. grain system with systems of other major grain exporting countries—Argentina, Australia, Brazil, Canada, and France. From that comparison important fundamental U.S. advantages become apparent, advantages to be preserved as changes to enhance U.S. grain quality are contemplated. These advantages are:

1. Ability to meet demand

The United States has the productive capacity to produce grain to meet almost any demand. When conditions during the 1970's caused a dramatic increase in demand, the Nation showed it had the productive and distributional capacity to meet that demand.

2. Produce most major grains

The United States can produce almost all of the major grains foreign buyers demand. The United States is the world's largest producer of corn and soybeans and the fourth largest producer of wheat. Competitor countries are limited to only a few grains and some to only one grain.

3. Ample storage facilities

Buyers can purchase nearly any type of grain at any time of the year because of our vast storage capacity. Many competitor countries do not have the facilities necessary to store grain for a long period of time and must therefore sell most of their grain shortly after harvest.

4. Efficient Marketing System

The U.S. marketing system is more complex and performs more challenging functions than the marketing system of any other exporter. Yet the efficiency of the U.S. grain handling and transportation system exceeds that of nearly all other countries.

5. Independent Grading and Inspection System

The U.S. grading and inspection system provides grade determination by an independent agency. Factors and factor limits in the grade standards are relatively stable from one crop year to another as are definitions of various classes of grain. This is not necessarily the case in other countries where changes may commonly occur with each crop year.

Keeping these important strengths in mind, the study analyzed the grain system from plant breeder to exporter. An overriding finding from the study is that technologies are in place to harvest, maintain, and deliver high-quality grain. Missing are the institutions and policies to provide incentives to use these technologies in a manner that is conducive to maintaining quality. The study identified a number of general problems that must be addressed.

GENETICS AND VARIETY RELEASE

An inverse genetic relation commonly exists between yield and important intrinsic quality characteristics in each of the major grains. In the case of wheat, this relationship is well recognized between yield and protein quantity, and a similar situation exists in corn and soybeans. Breeding programs generally aim to improve yield and disease resistance first and satisfy apparently desirable intrinsic quality goals second, if at all. In the case of corn, breeders have always sought to increase yield and improve harvestability, with intrinsic quality not being a priority. Yield is emphasized in many cases because intrinsic quality characteristics, though important, are not measured in the market. Incentives therefore are not transmitted through the market as readily as those associated with agronomic characteristics such as yield, disease resistance, and harvestability.

Individual breeders or their institutions exercise tremendous discretion regarding release of varieties. However, this discretion is tempered by the market system, which determines the success of any release. Market efficiency requires measurement of relevant intrinsic quality characteristics, which is absent in many cases. For example, a variety with a low yield but an improved intrinsic characteristic (e.g., bake test) that cannot be measured in the marketing system would fail to survive in the seed market. Current variety release procedures are not applied uniformly across States (or firms, in the case of private breeding) or over time. No effective national policy on variety release assures uniformity in application of release criteria. In the case of wheat, in which public breeding is more important, the State Agricultural Experiment Stations maintain variety release procedures that are in turn guided by the Experiment Station Committee on Organization and Policy. Individual States may and do vary from this policy. Ultimately, a particular class of wheat, corn, or soybeans produced in different parts of the Nation may differ in intrinsic quality.

GRAIN STANDARDS

Standards should reward positive actions, such as genetic improvement and sound harvesting, drying, and marketing practices. They should also incorporate descriptive terminology that provides the best information available on the value of each grain shipment.

Current grain standards are limited in four important ways:

1. They create incentives for practices inconsistent with good management and efficiency;
2. They fail to identify many of the characteristics related to value in use;
3. They fail to reward producers and handlers for improved drying, harvesting, handling, and variety selection; and
4. Grade limitations on many factors are arbitrary, do not always reflect real differences in value, and in some cases are not consistent with statistical principles.

No standard can be perfect and any revisions must consider tradeoffs. To move toward an ideal system, grain standards should be changed to include:

- grade-determining factors;
- non-grade-determining factors; and
- official criteria.

Grade-determining factors should relate to sanitary quality, purity, and soundness (absence of imperfections). Grade would be based on factors such as impurities, foreign material, total damage, and heat damage, The lower the values of any of these defects, the greater the value of the product.

Non-grade-determining factors would address properties such as broken kernels, moisture, oil and protein content, and other intrinsic characteristics or physical properties that influence values for major processing uses. Higher or lower percentages for those do not necessarily mean higher end-use value. The criteria for inclusion should be that the cost of obtaining the information is less than the value of that information to users who need it. By starting with the major products generated from each grain, a list of physical and chemical properties can be developed that are correlated with the value in use. New rapid testing technology is a requirement prior to inclusion.

Official criteria factors would be those requested by buyers and sellers. These would be developed only after evidence of sufficient demand to cover the costs.

BUYER'S ATTITUDES TOWARD OUALITY

An extensive survey was conducted as part of this assessment of grain buyers attitudes toward quality, grain standards, and merchandising practices. Several general findings are important.

First, buyers, but particularly those outside the United States, indicated that uniformity between grain shipments was a problem (i.e., uniformity in intrinsic quality). As processing technologies become more sophisticated, uniformity will become even more important.

Second, in the case of wheat, nearly half the foreign buyers relied on imports because of the inadequate quality of domestically produced wheat; foreign wheat was preferred to similar types of U.S. wheat where the cost was the same.

Third, buyers thought that the standards for wheat, corn, and soybeans were inadequate.

Of the key attributes currently not covered by grain standards, the survey showed that no one set of quality attributes for wheat meets the demands for all wheat products. Differences in what are considered important attributes exist between domestic and overseas wheat millers and by regions of the world. Protein, hidden/dead insects, falling number, pesticide residue, mycotoxins, and dough handling tests were considered the most important. Falling number and pesticide residue were identified by both groups as tests that should be included in the wheat standard. Hidden or dead insects were also identified by domestic millers for inclusion.

U.S. FARM POLICY

Two important features of U.S. farm policies have impacts on several aspects of quality. The inverse relationship between yield and intrinsic quality (e.g., protein in wheat) means the target price program has a negative long-term impact on intrinsic quality. This is because the target price typically exceeds the market price, creating an incentive to expand yields. Impacts vary by grain and region, depending on the extent of the inverse relationship. If target prices, which are based on yield, exceed market prices and if premiums associated with the measure of intrinsic quality are unchanged, incentives encourage farmers to increase yield at the expense of intrinsic quality. This effect has been exacerbated in previous farm bills, which used different methods of determining yield. The total impact in the case of wheat has been to force market premiums for wheat protein to relatively high levels in order to neutralize producers' decisions.

Administration of the loan rate program also has an impact on intrinsic quality, as well as on physical and sanitary quality. In particular, the market for measurable quality characteristics is distorted because premiums and discounts on forfeited grains, especially wheat, are less than those determined in the market. Poorer quality grain is put under storage, and market differentials are depressed.

CHANGING ROLE OF DEMAND

The international wheat market is more differentiated today than at any time in the past 25 years, a reflection of the divergent nature of end use and the intensity of exporter competition. Unique preferences were identified in the OTA survey across various types of wheat, suggesting homogenization would be counterproductive. In general, demand has shifted toward higher protein wheats and soft wheats. An important related problem in international wheat competition is that the market premium for protein has increased substantially in recent years. This has caused a number of difficulties in the marketing system due to measurement and uniformity problems, and has affected international competition. Specialization and sophistication in corn and soybean processing also have opened new markets with more exacting quality requirements.

COMPETITORS' POLICIES

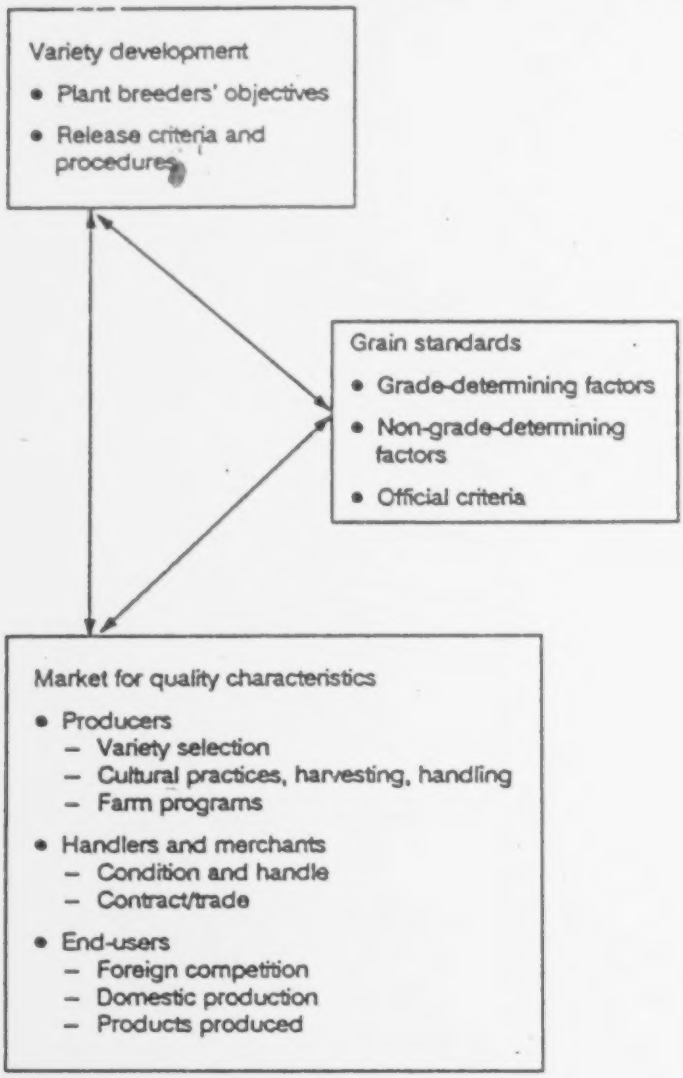
Major differences exist in the institutions, policies, and trading practices in other grain exporters marketing systems. The extent of market intervention varies from highly regulated ones throughout (e.g., Australia and Canada) to partial or no regulation elsewhere. Differences also exist in procedures for variety development and release, the use of variety identification in the marketing system, and the use of grain receival standards. In addition, a number of countries address grain quality problems as part of an integrated agricultural policy. At least for wheat exporters, the quality at first point of sale is more extensively controlled than in the United

States. The wheat from these countries is now probably preferred to the same price U.S. wheats due to these mechanisms.

POLICY OPTIONS

The overall purpose of any policy change related to this grain issue must be to create an environment that enhances grain quality. Important features of the U.S. grain system are variety development, grain standards, and the market for quality characteristics. These major components of the grain system are interdependent and each has an effect on grain quality (figure 1). Policy discussion in this country has traditionally focused on only one component of the system– grain standards. Yet, given that it is the operation of the overall system that influences grain quality, a far greater number of policy options exist than are normally discussed.

Figure 1.—Components of the Interdependent Grain System



SOURCE: Office of Technology Assessment, 1989.

The interdependence of the systems components must be recognized in the evaluation of policy options with the objective of establishing a more integrated relationship among them. In a number of other grain exporting countries, the policies are far more integrated and better coordinated. In fact the United States has made no effort to coordinate or integrate policies affecting these activities. Policies developed in the study, which over the long-term would result in improved quality, address underlying causes of the problem Thus, policy options are developed for the three major components of the grain system—variety control, the market, and grain standards. I will conclude my testimony with a brief discussion of each.

VARIETY CONTROLS

Three important considerations lead to the policy options listed under variety controls.

First, with few exceptions grain standards do not measure important intrinsic characteristics.

Second, intrinsic quality characteristics differ significantly across some grain varieties.

Third, varieties are not visually distinguishable, thus segregation in the market system is precluded, resulting in increased uncertainty in end-use quality. These three points apply to some extent to each of the grains. The classic case is that of wheat, in which performance varies across varieties, and increasingly it is becoming difficult to differentiate wheat in the marketing system. In some of these cases it may be easier to identify variety, or groups of varieties, than intrinsic characteristics. Further, identity of a variety provides more comprehensive quality information than any subset of measured quality characteristics.

Domestic processors attempt to resolve problems of varietal differences, to some extent, by purchasing by location or region. Foreign buyers, however, or in general any buyers using purely grade specifications are precluded from this alternative.

The options included under variety controls are:

(1) Variety identification—in which varieties can be identified in the marketing system, and

(2) Variety licensing—a more restrictive approach in which varieties are subjected to criteria administered at national level for release. Each option has its own unique set of advantages and disadvantages.

MARKET INTERVENTION

A number of policy options are considered under market intervention that include:

(1) Creating a marketing board,

(2) Providing an export bonus paid to exporters for delivering grain superior to that specified in the customer's contract,

(3) Providing increased differentials in premiums and discounts for loan forfeitures,

(4) Leaving unchanged the current policy on loan forfeitures, and

(5) Specifying a minimum quality for grain entering the loan program. Options could be implemented singly or in combination. A detailed discussion of each option is provided in the OTA report.

GRAIN STANDARDS

The 1986 Grain Quality Improvement Act, enacted into law by Congress, incorporated new objectives for grain standards. The identified objectives are:

1. To define uniform and accepted descriptive terms to facilitate trade:
2. To provide information to aid in determining grain storability
3. To offer end-users the best possible information from which to determine end-product yield and quality, and
4. To create the tools for the market to establish incentives for quality improvement.

Prior to this change the main objective of grain standards was to facilitate trade. No other criteria existed on which to base changes in standards. The Federal Grain Inspection Service (FGIS) now has a set of criteria on which to base changes in standards that are reflective of today's market. No standard will be able to meet the new criteria in its entirety and any revisions of current standards must consider trade-offs.

Three policy options that complement the new criteria for standards are identified:

(1) Mandatory inspection of interstate grain shipments—which means that approved testing procedures would be used throughout the market,
(2) Approval of testing equipment by a single agency—currently numerous state agencies have developed criteria for approving testing equipment and
(3) Mandatory inspection in conjunction with single agency equipment approval.

CONCLUDING COMMENTS

The production and marketing of grain in the United States is a highly interdependent system of activities. Any policy designed to enhance quality—physical, sanitary, or intrinsic—must address this interdependence.

Evaluating policy options in terms of their strengths and weaknesses as well as their interdependence is a complex task. One possible policy path that maximizes the strengths of the various options as well as minimizes their weaknesses is to adopt a variety identification system, increase the differentials in loan policy and specify minimum quality for loan eligibility, and introduce mandatory inspection in conjunction with Federal agency equipment approval. Selecting this policy path or any other path from the options discussed will spark much debate. However, if the United States is serious about making changes to enhance quality it must create an integrated policy that recognizes the interrelatedness of the system.

PREPARED STATEMENT OF DAVID ORR

Good morning Mr. Chairman, ladies and gentlemen. I appreciate the opportunity to participate in this hearing following Mike Phillips' comments on the results of the OTA grain quality and marketing study. FGIS is pleased and proud that a number of recommendations in the OTA study regarding grain quality improvements have already been initiated by FGIS, particularly in the area of developing objective testing technologies for grain quality analysis. FGIS has taken and continues to undertake a number of positive actions for improving grain quality.

For those who may not be familiar with the Federal Grain Inspection Service, I'd like to offer a brief background. FGIS was created by the U.S. Grain Standards Act in 1976. Approximately 900 FGIS employees are located in 30 field offices throughout the United States. The employees are responsible for providing official inspection and weighing services on grain at export locations as well as processed commodities such as flour, corn meal, and vegetable oils at interior markets. Official grain inspection and weighing services in the interior are not mandatory and are only provided upon request. These services are provided by private or state agencies which FGIS designates and supervises. The FGIS annual budget is approximately $45 million of which 82 percent is generated by user fees with the remainder being appropriated dollars.

Important progress has been made on many grain quality issues recently. I'd like to briefly highlight a few significant items for you. The most important action taken by FGIS concerning U.S. grain exports occurred on June 30, 1987, when FGIS issued regulations that prohibit the adding or recombining of dockage and foreign material, including sweepings and dust from bins into grain. This means that parties that violate the prohibition may be subject under the U.S. Grain Standards Act to administrative penalties that include denial of official services and civil penalties of up to $75,000, and criminal penalties that include imprisonment and fines up to $20,000. You may be interested to know that in October of last year FGIS settled an action against a party involving deceptive loading of several hopper cars for a civil penalty of $9,000 and a denial of official services.

In 1986 a primary source of quality complaints from foreign buyers of U.S. grain was high free fatty acid levels in soybeans. Free fatty acids, which lower the quality and reduce the shelf life of the soybean oil, are higher in soybeans with damaged kernels. To deal with this problem FGIS issued a more strict definition of damaged kernels. As a result free fatty acid levels in U.S. soybean exports have been cut in half and foreign complaints on that factor have been virtually eliminated.

In 1987 the most common complaint from our foreign buyers was in Hard Red Spring wheat. Our customers complained vigorously that wheat shipments arriving in their country had low protein levels compared to what was certificated in the U.S. port. FGIS conducted an extensive study which involved comparing samples from the United States and destination. Based upon this study, FGIS took several actions to improve its protein inspection program and again, complaints were dramatically reduced. In fact, just 34 complaints were received from foreign buyers last year. This is down from 59 complaints the previous year. As a percentage of the 5,473 export shiplots, those 34 complaints amounted to less than 1.0 percent. We

view this dramatic decrease in quality complaints as particularly exciting given the significant increase in export volume in the last year.

Prior to 1987, FGIS rounded wheat dockage down to the nearest half percent. Now we round dockage up or down to the nearest one-tenth of a percent. This has allowed foreign buyers to be more specific in their contracts when stating allowable dockage levels. We believe this has enhanced customer satisfaction. We are currently cooperating with USDA's Economic Research Service to study the effects of combining dockage and foreign material into a single factor in the wheat standards.

Grain often is loaded aboard ships at rates of more than 100,000 bushels per hour. Obviously FGIS can't inspect every one of those bushels. We do take samples mechanically approximately every 18 seconds, however a statistically based sampling and inspection plan is still necessary. FGIS has adapted for its use a quality control plan used in manufacturing and other industries called Cumulative Summation, or Cu-Sum for short. Cu-Sum takes into account variations due to sampling limitations, equipment capabilities, and inspector performance. A study was initiated by FGIS in 1985 to evaluate the relationship between the use of the Cu-Sum plan and its effect on determining the quality of export grain. Based upon the results of this study, on January 24, 1989, FGIS published a proposal to revise the Cu-Sum plan. We are inviting public comments on the proposal until May 24, 1989.

I'm sure that many of the attendees today are producers of wheat or sunflowers and are aware of the importance of end-use value testing. FGIS has offered wheat protein and sunflower seed oil testing services for years. This has provided important information that allows the marketplace to reward those producers who deliver the highest quality constituents such as protein and oil. FGIS intends to expand the use of objective tests for more quality analyses. We have proposed to begin offering on September 4 of this year oil and protein testing services for soybeans on a request basis. The service will utilize near infrared spectroscopy technology similar to that currently used for wheat protein testing. Providing this information on export shipments should help retain or expand market share in important overseas markets by making foreign buyers better informed customers. We believe this will also help U.S. soybean producers, processors and breeders in the identification of high oil and protein varieties.

Additional projects currently underway at FGIS include:

1. Developing methodology to detect hidden insect infestation, and reviewing our current procedures for checking for live adult insects;
2. Researching different instruments for objectively determining wheat class to replace the current visual classing method;
3. Expanding the availability of the Falling Number test for sprout damage to all wheat exporting locations;
4. Developing more rapid and accurate procedures for determining the presence of af aflatoxin in corn through the use of biotechnology-based diagnostic probes. We also hope to expand this work for the detection of other mycotoxins;
5. Investigating the use of digital imaging for determining such factors as net sound grain and damaged kernels;
6. Developing near infrared spectroscopy calibrations for barley protein and corn protein, oil, starch and moisture; and
7. Investigating the possibility of using instrumentation to identify undesirable grain odors and the quality problems associated with those odors.

In establishing new standards we apply four basic objectives. New standards should facilitate trade, provide an indication of storability, provide end-product yield and quality information and provide a framework for markets to establish quality improvement incentives.

As you can tell from my comments FGIS is pleased at the progress that has been made on the wide range of quality issues recently. However work remains to be done. As FGIS continues its work we look forward to input from producer to the end user to ensure that any changes are made with the best interests of all in the grain industry in mind.

PREPARED STATEMENT OF JERRY HAWKINS, SOUTH DAKOTA WHEAT PRODUCER

Mr. Chairman, members of the committee. My name is Jerry Hawkins and I appreciate this opportunity to present testimony on grain quality and inspection.

First, I will briefly talk about grain *quality*. There's no question that we raise the best *milling* and *baking quality* wheat in the world, so I assume you want to hear about the cleanliness of wheat in the domestic and export markets.

There is no question that we need to do a better job of serving our customers, particularly our foreign ones. Our domestic millers can go out in the country and buy the kind of wheat they want. Obviously, our foreign customers don't have that same opportunity.

Recent shipments of wheat have contained wheat that has been in storage for many years under the CCC Program. Most of the CCC wheat has passed through the markets, newer grain is now being shipped, thus reselling in a higher quality of wheat.

I believe the best approach to helping our foreign buyers is an educational one. Through U.S. Wheat Associates, the Northern Crops Institute and others, we have been helping buyers write the contract specifications so they will get exactly the kind of wheat they want. Most overseas customers just tender for No. 2 or better grade wheat. We believe they should specify what they want more clearly. It's not very hard to write down the amount of protein, dockage, foreign material or falling number they desire. If they do that, FGIS will certify that's what they will receive.

Some other actions relating to grading standards need to be put into place. Right now, FGIS is proposing to tighten up the CU-SUM loading plan for loading vessels. I believe this will eliminate a lot of the problems we have. FGIS is also studying the possibility of combining dockage and foreign material into one grading factor, and that will help too. We have already seen changes in reporting dockage, insect infestation and protein certification.

We need to move slowly and carefully on grain quality issues. Changes need to be brought about, but everyone in the grain business from farmer to exporter has to be able to live with them.

I'm afraid that if we legislate clean grain, the farmer will be the one who pays the cleaning bill. I don't think Cargill will pay it.

We need to consider the *OTA* study that was just completed. Some of the findings can probably be put in place and benefit all of us.

Some of our customers can't afford No. 1 wheat. We have to be able to satisfy their needs with a lower quality, if they want it.

Lastly, I think we need to remember that all the wheat delivered by farmers is *not* No. 1 grade. I have a chart prepared on all the Spring wheat grown in South Dakota, North Dakota, and Minnesota, and Montana from 1983-1987. It clearly shows that only *60 percent* of our total production was No. 1. Forty percent was No. 2, No. 3 or less. How are we going to deal with the 40 percent? Farmers will lose a lot of money if there isn't *some* provision for blending this poorer grade with the No. 1 wheat. We can't go overboard, but we simply can't sell 40 percent of our wheat for hog feed and survive as wheat farmers.

What We Grow vs. What We Ship
(Prepared by North Dakota Grain Dealers Association)

Yr.	U.S. HRSpring Wht Prod (mil bu.)	95% grown in ND, SD, MN, Mt (mil bu.)		% by grade	mil. bu by grade
83	323	307	#1	55%	169
			#2	26%	80
			#3 or less	19%	58
84	409	389	#1	74%	288
			#2	14%	54
			#3 or less	12%	47
85	460	437	#1	52%	227
			#2	11%	48
			#3 or less	37%	162
86	451	428	#1	50%	214
			#2	14%	60
			#3 or less	36%	154
87	431	409	#1	68%	278
			#2	13%	53
			#3 or less	19%	78
	2,074	1,970			

*According to Regional Quality Report published by Cereal Sci. & Food Tech Dept. at NDSU

Totals Produced 1983-87

#1	1,176 mil bu.	60%	
#2	295 mil bu.	15%	} 40%
#3 or less	499 mil bu.	25%	

Totals exported 1987

In 1987 Federal Grain Inspection Service analyzed 99.7% of wheat exports from the U.S. Of the 531 HRS lots representing 179 million bushels all but 3 lots were U.S. # 2 or better. This indicates quality is certainly not downgraded in the marketing chain.

Thank you for the chance to testify. I will try to answer any questions you might have.

PREPARED STATEMENT OF LARRY DIEDRICH, SOUTH DAKOTA SOYBEAN ASSOCIATION

I want to thank Senator Daschle for holding a field hearing on the issue of grain quality in the United States. We have all heard horror stories about the quality of U.S. grain, and about some of our foreign customers receiving dirty grain from this country.

According to the stories, our foreign customers have received grain laced with gravel, dust, bits of iron and all sorts of other foreign materials. What they receive is not at all what they contracted for, and the implications are that someone has tampered with their shipment.

The awful details, if they are true, would make you ashamed to be part of the U.S. grain system.

Perhaps there is some shadow of truth to these allegations. An article in the March 18, 1989, issue of *Pro Farmer* summarized the publicized study on grain quality by the Office of Technology Assessment (OTA). The study compared the grain handling practices of five export competitors with those of the United States, and came up with three major differences between our export competitors and the United States.

To quote:

1. Competitors take great pains to preserve grain quality from the time it is first brought to market.

2. If they do have to blend to meet customer specifications, competitors make sure the blending is uniform throughout the shipment. Lack of uniform blending is a major complaint of both foreign and domestic buyers of U.S. grain.

3. Minimum quality standards for acceptance into the marketing system at any price are much lower in the United States than among competitors.

Whether there really is a problem with the quality of U.S. grain, as this study suggests, is extremely difficult to judge from here in South Dakota.

However, after digging into the issue of grain quality, I come to the conclusion that many of those "horror stories" deserve to be identified as such. Although we have all heard some of these stories, I am hard-pressed to find any proof to substantiate them. It seems for the most part they tend to be based on a great deal of hearsay, with little or no documentation to back them up.

On the other hand, we can document the work of the Federal Grain Inspection Service (FGIS). This agency inspects and certifies the grain that leaves this country. The FGIS also ensures that the official U.S. Grain Standards are enforced in the marketplace.

Last year, for example, the FGIS inspected 5,473 lots of wheat. When those lots got to their foreign destinations the FGIS received 34 official complaints. Now 34 out of 5,473 amounts to less than 1 percent of all wheat inspected in 1988.

That does not indicate a significant problem.

Looking further into the issue of grain quality, my research has yielded some interesting points. I asked my staff to contact representatives from the wheat, corn, and soybean industries in the state. The report from all three industries is the same.

The first thing they tell me is that foreign buyers are getting the type of grain specified by their contracts and the type of grain they pay for.

As an example, Betty Hansen, Executive Secretary of the South Dakota Soybean Association tells about being in Portugal last fall. The grain buyer they were talking to in Portugal pointed out the difference between shipments received from Brazil and from the United States. He said that Brazilian beans were better, because Brazil's shipment had 1 percent foreign matter while the United States' had 2 percent foreign matter.

Then Betty asked him what he had contracted for. After hedging a bit, the buyer finally said that he had specified 1 percent F.M. from Brazil, and had specified 2 percent F.M. from the United States, because of the cost savings.

He got what he contracted for. If he issued a contract for 1 percent F.M. from the United States, he undoubtedly would have received 1 percent F.M. grain.

The same is true in other grains. I feel that many of ourforeign customers buy simply on price. For the prices they arewilling and able to pay, they can purchase only No. 2 or No. 3 grain. The No. 1 grain costs more, but few are willing to pay what it's worth.

There are exceptions to this. Some of our foreign grain customers such as Japan, Taiwan, and Korea are very sophisticated buyers. They write contracts with strict specifications for top-quality grain, and that is what they receive.

This leads me to suggest that the logical answer to the "problem" of grain quality is to help our foreign buyers become better educated about the U.S. grain system.

Just as a good salesperson is there to help educate a buyer about the specific attributes of a product, and how those attributes vary from one product to another, so the United States grain industry should help educate foreign buyers about the attributes of different grades of grain.

We have a complex grain system, but it is a system that seems to serve the industry well. If we help buyers become educated about our system, they will better understand what they want and will be able to write specifications for the type of grain they want and need.

I would like to conclude with the observation that the "problem" of grain quality today—if, indeed, there is a problem—is nothing compared to what it was in the 1970's.

The grain industry should be commended for taking the initiative over recent years to clean up their own act. There have been major improvements in the grain standards, and there continues to be improvement. I understand from the Wheat Commission that grain companies are shipping cleaner wheat today than they were even 6 months ago.

As I understand, this tightening of the grain standard has been a cooperative effort of the entire grain industry—everyone from farmers to elevators to grain handlers all working together.

There is no way we will ever completely eliminate the problem, because there is always a chance that something will slip through. However, I feel there have been tremendous improvements recently, and fully expect that trend to continue.

STATEMENT OF JEFFREY S. BROIN, MANAGER, BROIN ENTERPRISES, INC., ETHANOL PLANT, SCOTLAND SD

Mr. Chairman, members of the committee, I appreciate this opportunity to discuss the topic of grain quality in our home state of South Dakota, and also to explain to you an alternative use for distressed grain in local areas.

My name is Jeff Broin and I am manager of Broin Enterprises, Inc., South Dakota's only fuel ethanol plant. My family purchased this bankrupt facility in 1987, after successfully operating a smaller facility in Minnesota for 3 years. The Scotland facility underwent major renovations before its start-up in July of 1988. I am happy to report that the plant is on-line and at 100 percent capacity at this time. South Dakota has proven to be an excellent business atmosphere, and local and state support has been outstanding.

Ethanol production is the enzymatic conversion of the starch content in grain to sugar, which in turn can be converted to alcohol by fermentation. This process produces an 11 percent grain "beer". The alcohol content of the mixture is then distilled out of the beer, producing approximately 2.5 gallons of ethanol per bushel of corn. The remaining portion of the beer is then separated by a centrifuge process into distillers grain, a 30 percent solids high quality feed; and sweet water, a high quality liquid feed. The two feed products are averaging 35 percent protein on a dry matter basis, and are also very high in energy, fat, and micronutrients.

Ethanol production, as a fuel industry, is also currently experiencing increased potential for demand due to Federal clean air standards and the potential for ethanol blended fuels to help cities meet these standards. The use of ethanol blended fuel can reduce carbon monoxide emissions from automobiles from 15 to 33 percent. New technology is also playing a big part within the current ethanol industry. American Eagle Fuels, an ethanol production and research company, is currently testing a new bacteria technically named Xymomonous mobilus, that has the potential to replace yeast in the fermentation process. This bacteria has shown slightly increased yields of ethanol per bushel of grain, as well as a more pure grade of ethanol and slightly more advantageous feed products. The same company is also researching the production of Ethyl Tertiary Butyl Ether, more commonly known as ETBE. The combination of other products with ethanol produces a pipeline fungible fuel that seems to be a much superior product when compared to TBE, an octane enhancer currently used in many fuels. MTBE contains methanol, a natural gas derivative that the United States is currently importing.

The importance of grain quality also plays a major role in the ethanol industry. Grain quality is very relevant to the operation of our ethanol plant, as well as other ethanol plants throughout the United States. Heat and insect damaged grain, as well as grain with foreign odors, make up approximately 80 percent of the grain processed into ethanol at our facility. Despite discoloration and other damage, the poor quality grain will produce a high percentage of the ethanol available from No. 2 grain. The feed coproducts available at our ethanol plant have been tested extensively, and also have little or no change in value relative to the grain quality. The fact that ethanol production from distressed grain has little impact on normal operations allows an ethanol facility to pay a higher price than most grain handlers for this low quality grain, while also turning it into high quality, sterilized feed products. The feed products also are enhanced by the cooking of the original beer, which creates a 60 percent by-pass protein from the Browning effect; and also by the predigestion of the fat content of the grain in the production process, allowing a ruminant to digest up to six times as much of the end product fat.

The end result is the production of ethanol and high quality protein feed from low quality grain. The feasibility of this process not only helps the producer receive a higher price for distressed grain, but also helps ethanol production costs in the long run. I feel that a large percentage of the low quality grain in the United States should be used to produce a fuel source that not only helps reduce our dependence on imported oil, but that also aids the domestic producer in grain prices and provides a high quality feed product for cattle feeders. The net result of this is cleaner grain exports, and a reduction in the overall national problem of grain quality.

ENHANCING THE QUALITY OF U.S. GRAIN FOR INTERNATIONAL TRADE

SUMMARY

CONGRESS OF THE UNITED STATES OFFICE OF TECHNOLOGY ASSESSMENT

CONTENTS

	Page
Major Findings	2
Fundamental Advantages of the U.S. Grain System	2
Competitors' Policies	3
Problem Areas	3
Quality in the Marketplace	13
Policy Options	15
Variety Controls	16
Market Intervention	18
Grain Standards	21
Interaction Between Standards, Variety Control, and Market Intervention	23
Conclusions	24

Figures

Figure	Page
1. Moisture, Temperature, and Relative Humidity Interactions	6
2. Importance of Uniformity Between Shipments	14
3. Components of the Interdependent Grain System	15

Tables

Table	Page
1. Comparison of Institutions and Policies Affecting Grain Quality of Major Grain-Exporting Countries	4
2. Fundamental Policy Alternatives	16

Foreword

American agriculture, long the sector of the economy considered the most productive and competitive in the world, began to show signs of declining international competitiveness in the early 1980s. Many reasons have been given for this, including the problems of the quality of U.S. grain. The quality issue is receiving renewed attention in the current world buyers' market for grain. Some are concerned that as the influence of important economic variables such as the strength of the dollar and the extent of agricultural price support cause U.S. exports to become more price-competitive, opportunities to increase exports may be hampered by buyers' qualms about U.S. grain quality.

Complaints of overseas buyers about low-quality U.S. grain receive widespread attention. Buyers protest that they receive dirty, molded, or infested grain, or that characteristics contracted for, such as a certain protein level, were not met. Exporters argue that foreign buyers are using quality complaints to bargain for lower prices. Farmers and many Members of Congress point to loss of market share to prove the importance of quality. The problems—real or perceived—have persisted for many years, and neither industry response nor congressional actions to date provide a satisfactory answer or reassure U.S. customers.

During debate on the Food Security Act of 1985, the issue of the quality of U.S. grain was again raised. It became apparent that insufficient information was available to make wise decisions. Congress then amended the act and directed the Office of Technology Assessment to conduct a comprehensive study of the technologies, institutions, and policies that affect U.S. grain quality and to prepare a comparative analysis of the grain quality systems of major export competitors of the United States. The study was also requested by the House Committee on Agriculture and the Joint Economic Committee.

OTA's grain study produced two separate reports. The first, *Enhancing the Quality of U.S. Grain for International Trade*, is summarized in this document. It focuses on the U.S. grain system and possible changes within that system to enhance grain quality. The second report, *Grain Quality in International Trade: A Comparison of Major U.S. Competitors*, provides OTA's analysis of the grain quality systems of other major exporters.

OTA greatly appreciates the contribution of the advisory panel, authors of technical background papers, the many industry associations, and other advisors and reviewers who assisted OTA from the public and private sector. Their guidance and comments helped develop a comprehensive study. As with all OTA studies, however, the content of this report is the sole responsibility of OTA.

John H. Gibbons

JOHN H. GIBBONS
Director

Advisory Panel
Enhancing the Quality of U.S. Grain for International Trade

Donald E. Anderson
General Partner
The Andersons
Maumee, OH

Roger Asendorf
American Soybean Association
St. James, MN

G. (Jerry) W. Becker
Vice President and General Manager
Caldwell Manufacturing Co.
Kearney, NE

James B. Buchanan
Vice President and Manager of
Grain & Feed
Illinois Cereal Mills, Inc.
Paris, IL

William J. Cotter
Director of Operations
Port of Corpus Christi Authority
Corpus Christi, TX

James F. Frahm
Director of Planning
U.S. Wheat Associates
Washington, DC

Maurice A. Gordon
U.S. Feed Grains Council
Rantoul, IL

William W. Hay
Millers National Federation
Minneapolis, MN

Jerry P. Krueger
National Association of Wheat Growers
Warren, MN

Roald H. Lund
Dean, College of Agriculture
North Dakota State University
Fargo, ND

Richard L. McConnell
Director of Corn Research
Pioneer Hi-Bred International, Inc.
Johnston, IA

Paul B. Mulhollem
Group President
World Oilseeds Group
Continental Grain Co.
New York, NY

Seiichi Nagao
General Manager
Cereal and Food Research Laboratory
Nisshin Flour Milling Co., Ltd.
Tokyo, Japan

Grayce "Susie" Pepper
Purchasing and Office Manager
Zip Feed Mills, Inc.
Sioux Falls, SD

Harold E. Reese
Vice President and Assistant
Division Manager
Bunge Corp.
Destrehan, LA

Thomas C. Roberts
Executive Vice President
Wheat Quality Council
Manhattan, KS

Ronald E. Swanson
National Corn Growers Association
Galt, IA

D. Leslie Tindal
Commissioner
South Carolina Department of Agriculture
Columbia, SC

NOTE. OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

OTA Project Staff
Enhancing the Quality of U.S. Grain for International Trade

Roger C. Herdman, *Assistant Director, OTA*
Health and Life Sciences Division

Walter E. Parham, *Food and Renewable Resources Program Manager*

Michael J. Phillips, *Project Director*

David M. Orr, *Senior Analyst*
Lowell D. Hill, *Contractor*
William W. Wilson, *Contractor*
Julie A. King,[1] *Analyst*
Linda Starke, *Editor*

Administrative and Support Staff

Sally Shafroth[2] and Nathaniel Lewis,[3] *Administrative Assistants*
Nellie Hammond, *Secretary*
Carolyn Swann, *Secretary*

[1]Through March 1987.
[2]Through April 1987.
[3]From May 1987.

Major Contractors
Enhancing the Quality of U.S. Grain for International Trade

Stephen P. Baenziger
University of Nebraska

Fred W. Bakker-Arkema
Michigan State University

C. Phillip Baumel
Iowa State University

Joe W. Burton
U.S. Department of Agriculture
Raleigh, NC

Roy G. Cantrell
North Dakota State University

Jack F. Carter
North Dakota State University

Harry H. Converse
U.S. Department of Agriculture
Manhattan, KS

Bert L. D'Appolonia
North Dakota State University

Robert Davis
U.S. Department of Agriculture
Savannah, GA

Joel W. Dick
North Dakota State University

Patrick L. Finney
U.S. Department of Agriculture
Wooster, OH

Richard C. Frohberg
North Dakota State University

Paul Gallagher
Kansas State University

Hagen B. Gillenwater
U.S. Department of Agriculture
Savannah, GA

Charles R. Hurburgh
Iowa State University

Howard L. Lafever
Ohio State University

Karl A. Lucken
North Dakota State University

Paul J. Mattern
University of Nebraska

Marvin R. Paulsen
University of Illinois

Tilden W. Perry
Purdue University

David B. Sauer
U.S. Department of Agriculture
Manhattan, KS

Mark D. Schrock
Kansas State University

Rollin G. Sears
Kansas State University

Thomas L. Sporleder
Texas A&M University

A. Forrest Troyer
DeKalb-Pfizer Genetics

Summary

More competitors exist in the international grain market now than ever before, and grain quality has become an extremely important competitive factor. In a mere decade, growth in grain suppliers has been phenomenal. In the 1970s, one-third of the world supplied grain to two-thirds of the world's people. Today, the reverse is true: two-thirds of the world supplies grain to the other third. This competitive environment has made foreign buyers increasingly sensitive about the quality of grain they receive.

During the debate on the Food Security Act of 1985, many Members of Congress expressed concern about the quality of U.S. grain exports. Grain elevator operators and export traders were accused of adultering loads of grain shipped to foreign buyers; these allegations were supported by a sharp increase in foreign complaints about quality. Grain traders and handlers maintained that they have been shipping grain according to specifications, and that most complaints were motivated by buyers' desires to obtain a higher grade of grain at a lower price.

The debate often focused on the adequacy of today's grain standards, developed over 70 years ago. Critics argue that the standards themselves are to blame for customer complaints. They claim that standards have not kept pace with the changing world marketplace and are frequently misunderstood by foreign buyers.

By focusing on standards, those debating about U.S. grain quality are seeing only part of the picture. Improving quality—or even the perception of quality—will be much more complicated than tinkering with the criteria for standards. Grain is vulnerable to quality deterioration at virtually every stage of production and marketing. Before changes can be contemplated, full understanding is needed of the complex, interrelated system of:

- developing varieties of grain,
- producing grain,
- harvesting grain,
- storing grain,
- handling grain, and
- testing grain.

Understanding these relationships is the main goal of this assessment.

First, it is important to clarify what is meant by grain quality. Webster defines quality as an essential character, a degree of excellence, or a distinguishing attribute. In grain, such a definition has come to mean a variety of things—being free of foreign material, not cracked or spoiled, or having the proper characteristics for a particular end use. No one definition of quality as it relates to grain has been accepted.

For the purpose of this assessment, quality is defined in terms of physical, sanitary, and intrinsic characteristics.

- *Physical quality* characteristics are associated with outward visible appearance of the kernel or measurement of the kernel. Included are kernel size, shape and color, moisture, damage, and density.
- *Sanitary quality* characteristics refer to the cleanliness of the grain. They include the presence of foreign material, dust, broken grain, rodent excreta, insects, residues, fungal infection, and nonmillable materials. These are essentially characteristics that detract from overall grain value.
- *Intrinsic quality* characteristics are critical to the end use of the grain. They are nonvisual and can only be determined by analytical tests. In wheat, for example, such characteristics refer to protein, ash, and gluten content. The characteristics depend on the grain and the end use within a grade.

MAJOR FINDINGS

The U.S. grain marketing system has a number of important characteristics. Handling (including exporting) and transport industries are highly competitive and there is relatively limited government intervention in the system. **One key principle throughout the U.S. system is that of self-selection.** Producers plant varieties perceived to be in their best interest; users (domestic and importers) specify and purchase certain qualities that are in their interest, given a range of alternatives and prices; handlers and exporters condition and move grain in their own interest. Each decision is based on the sovereignty of the individual decisionmaker, and takes into account incentives and disincentives reflected in market premiums and discounts for quality characteristics.

Fundamental Advantages of the U.S. Grain System

An important component of this study was a comparison of the U.S. grain system with the systems in other exporting countries. OTA collected information on production and distribution in Canada and sent study teams to Argentina, Brazil, France, and Australia to document their systems. **Five fundamental advantages of the U.S. marketing system are apparent: efficiency, productivity growth, wide range of qualities, the grading and inspection system, and market-determined premiums and discounts.**

Efficiency

The U.S. marketing system performs a number of complex functions—it assembles, handles, conditions, and allocates different qualities to domestic buyers in many locations and for export from a multitude of ports. Indeed, given the quantity produced, the many differences in qualities at different locations, and numerous locations of end-users and ports, the U.S. marketing system is more complex and performs more challenging functions than the marketing system of any other exporter. Yet the efficiency of the U.S. grain handling and transport system exceeds that of nearly all other countries, assuring lower marketing margins and higher prices to producers.

Productivity Growth

Plant breeding in the United States is relatively unfettered, compared with other countries, in terms of regulations over variety development and release. Ultimate success of varieties is determined by the market for seed stocks. Producers make choices in response to market incentives. Where comparisons are appropriate (i.e., in wheat), productivity growth as measured by yield exceeds that of most other exporters, with the exception of France. Productivity differences are affected by a multitude of factors including environment, soils, other inputs, relative prices, institutions, and policies. Thus, it is impossible to attribute yield differences to the institutional environment affecting varieties, but growth rates are influenced by variety release procedures.

A Wide Range of Qualities

No other country can offer such a wide range of intrinsic differences in grains to customers. This is obvious given the class differences in wheat, which is facilitated by production regions of differing environments and soils. Also, a wider range of physical and sanitary qualities exists in the United States than elsewhere. This is an advantage in the sense that more alternatives are available to buyers, some at lower costs, but it may be viewed as an externality in the sense that reputation is affected. The uniformity problem (discussed later) is a direct result of the multitude of qualities available. In addition, given such an unfettered system, importers need a certain amount of expertise to benefit fully from the wide range of qualities.

Grading and Inspection System

The U.S. grading and inspection system provides grade determination by an independent agency (i.e., one not having financial stakes in

the transaction). Factors and limits in factors in the grade standards are relatively stable across crop years (i.e., the definition of No. 2 corn does not change from year to year). Similarly, the definition of No. 2 Hard Red Winter wheat does not change, although intrinsic differences not measured in the standards may change. This is not necessarily the case in other countries. Major changes to the U.S. system cannot be implemented in less than a year after they are promulgated. Some other exporters adjust factor limits with each crop year.

Market-Determined Premiums and Discounts

Premiums and discounts and/or regulations in all countries are used to provide quality incentives to market participants. **Those established in the United States are via the interaction of supply and demand for measurable quality characteristics,** i.e., the market for quality characteristics. Consequently, U.S. values perhaps reflect true values better than do premiums and discounts administered in several other exporting countries. A notable exception is France. Efficient determination of price differentials is important because they essentially allocate grain across end-users and provide signals throughout the production and marketing system. Through these differentials the system responds to market needs.

Competitors' Policies

The institutions, policies, and trading practices in the marketing system of the major grain exporting countries differ considerably. The extent of market intervention varies from highly regulated throughout (e.g., Australia and Canada), to partial, or no regulation. Differences exist in procedures for seed variety development and release, the use of variety identification in the marketing system, and the use of grain receival standards (table 1-1). **In addition, a number of other countries address grain quality problems as part of an integrated agricultural policy.** Major foreign wheat exporters have more extensive controls at first point of sale than U.S. exporters. Wheat from other countries is probably preferred over comparably priced U.S. wheats due to these mechanisms.

The policy and institutional structure of the U.S. grain system provides the framework for various grain-handling practices. **Technologies for producing and handling grain are quite similar among competing countries.** The main difference is that the United States is slightly more efficient in using these technologies. But points in the marketing channel at which they are used differ.

A case in point is cleaning. Outside the United States, most exporters clean grain at the first point of receipt. Canada and Australia are two exceptions, although for different reasons. Canada, however, is studying the economic feasibility of cleaning grain in the country versus at export and will probably change. Australian farmers deliver grain that does not need to be cleaned, unlike the situation in the United States. Basically, no economic incentive exists to clean grain at the first point of receipt in the United States.

The other major handling practice in which the United States differs from other exporters is blending. Blending U.S. grain over wide ranges of quality to create a uniform product for sale is necessitated by the lack of any minimum receival standard. Blending exists outside the United States but not to the same extent. In other countries it is done over very narrow ranges in quality. These exporters basically have grain of uniform quality moving throughout the system. The U.S. system lacks uniformity in quality throughout the market channel. At export, grain is blended in an attempt to produce a uniform quality that meets buyers' specifications. The OTA survey of foreign and domestic buyers of U.S. grain clearly indicated that lack of uniformity between shipments is the buyers' biggest complaint.

Problem Areas

Genetics and Variety Release

Genetically, yield and important intrinsic quality characteristics are often inversely re-

Table 1.—Comparison of Institutions and Policies Affecting Grain Quality of Major Grain-Exporting Countries

Activity/Policy	United States	Argentina	Brazil	France	Canada	Australia
Seed variety control	No State or Federal control. Release of varieties influenced to some extent by land-grant universities. Largely the market determines adoption of varieties.	Committee of government and industry must approve agronomic properties. Quality factors of minor influence.	Committee with broad representation directs research and approves varieties. Quality is potential criterion but not currently effective.	Formal mechanism exists that regulates release of varieties based on agronomic and quality criteria.	Formal mechanism used to license new varieties. Agronomic and quality criteria given equal weight in testing new varieties.	Formal mechanism followed as a prerequisite for release of varieties. Quality and agronomic criteria are used.
Grain receival standards	None. All types of quality are accepted with appropriate discounts for low-quality grain.	Grain not meeting a specified minimum quality (Condition Camara) is rejected at first point of sale.	Soybeans not meeting a minimum quality are rejected at first point of sale.	Grain not meeting export contract specifications can be rejected by surveying company or receiving elevator.	Developed eight grades for CWRS to differentiate quality. Lowest grade goes to feed market.	Wheat must meet minimum quality standards. If not it is allocated to feed market.
Marketing by variety	No mechanism exists for variety identification.	Variety is not identified in marketing channel.	Variety is not identified in marketing channel.	Very common. Variety often specified in wheat contracts.	Licensed grain must be visually distinguishable.	Very common-use variety control scheme to facilitate segregation by classes.
Price	Loan rate is principal price policy. Includes premiums and discounts for major grains but has not been responsive to market conditions.	Government establishes minimum prices for farmers and exporters. Government also establishes premiums for high-quality grain.	Government establishes a minimum price prior to planting. It is adjusted during the crop year to account for inflation and political pressure.	Key policy is European Community intervention price, which includes premiums and discounts for quality factors. Lower qualities of wheat equated to feed values.	Initial producer price is the principal price policy. Separate prices established for each grade of grain. Lower qualities of wheat equated to feed values.	Guaranteed minimum price (GMP) is key price policy. It is established by class and provides differentials for quality. Lower qualities of wheat equated to feed values.
Farm Storage	Farm policy in past decade has encouraged extensive on-farm storage and inter-year storage.	Government policy through pricing does not encourage on-farm or inter-year storage.	No incentive for farmers to store on farm.	Farm policy through the Common Agricultural Policy (CAP) has not encouraged development of extensive on-farm storage. Also relatively limited inter-year storage due to CAP.	Producer deliveries are regulated to primary elevators via quotas. On-farm storage is substantial.	Use of GMP provides no incentive for delivery in post-harvest period, leading to minimal use of on-farm storage.

SOURCE: Office of Technology Assessment, 1990.

lated in each of the major grains. In the case of wheat, it is well recognized that yield and protein quantity are inversely related. In corn, the trade-off is between protein, starch, and yield; in soybeans, it is between protein and yield. Breeding programs generally aim to improve yield and disease resistance and to satisfy apparently desirable intrinsic quality goals.

In the case of corn, most breeders have always sought to increase yield and improve harvestability, with intrinsic quality not being a priority. **The potential for improving quality through genetics is quite high.** However, many quality factors are traits known to be influenced by many genes. This makes enhancing quality more difficult than altering a trait influenced by a small number of genes. The task is further complicated by the fact that genetic alteration of one trait frequently leads to undesirable changes in other plant traits.

New crop varieties require approximately 9 to 12 years for development and release. If there were a change in plant breeding program objectives in 1989, such as development of new varieties with enhanced quality factors, it could be the end of the century before these new varieties were commercially available.

The emphasis on yield in many cases is due to the fact that though intrinsic quality characteristics may be important, they are not measured in the market. Incentives to improve intrinsic quality characteristics therefore are not transmitted through the market as readily as those associated with agronomic characteristics, such as yield, disease resistance, and harvestability.

Individual breeders or their institutions can exercise tremendous discretion regarding release of varieties. This is tempered, however, by the market system, which determines the success of any release. Market efficiency requires measurement of relevant intrinsic quality characteristics, which is absent in many cases. For example, a variety with lower yield but an improved intrinsic characteristic (e.g., bake test) not measurable in the marketing system would fail to survive in the seed market. Variety release procedures as currently practiced are not applied uniformly across States (or firms, in the case of private breeding) or over time.

No effective national policy exists on variety release that would assure uniformity in application of release criteria. In the case of wheat, in which public breeding is more important, the State Agricultural Experiment Stations maintain variety release procedures. These are in turn guided by the Experiment Station Committee on Organization and Policy. However, since no legally binding procedures for controlling the release of varieties exist, individual States can and do vary from this policy. Thus the criteria for variety release may not be uniform across States or consistent over time. Ultimately a particular class of wheat, corn, or soybeans produced in different States may differ in intrinsic quality.

Technologies Affecting Quality

Grain is a living organism and as such is a perishable commodity with a finite shelf life. Drying, storing, handling, and transporting technologies cannot increase quality once the grain is harvested. Each technology is a self-sustaining operation, but the way each is used has an impact on the ability of the others to maintain quality. For example, if grain is harvested wet, not only will this lead to increased breakage during harvesting, but it means the grain must be dried. Improper drying can lead to more breakage and to nonuniform moisture content. Moisture content, moisture uniformity, and the amount of broken grain and fine material affects storability and can have an impact on the technologies used to maintain quality during storage. Therefore, decisions made at harvest, as well as at each step thereafter, affect the system's ability to maintain and deliver a quality product.

Moisture.—Moisture at harvest directly affects the amount of kernel damage produced through combining. Since cereal grains and oilseeds are harvested in the United States at moisture levels too high for long-term storage or even short-term storage and transportation, these commodities must be dried to acceptable mois-

ture levels. Corn, which is harvested at 20 to 30 percent moisture, must be dried to 14 to 15 percent for safe storage. Wheat and soybean harvest moistures are substantially lower than corn, with safe storage levels marginally lower than harvest moisture. In certain regions of the United States, wheat and in some cases corn and soybeans dry naturally in the field.

The process of drying has a greater influence on grain quality than all other grain handling operations combined. If superior grain quality is to be produced, it is imperative to optimize the dryer type and its operation since half the corn crop is dried in continuous-flow, portable batch, and batch-in-bin dryers. Of particular concern is the increase in breakage of corn and soybeans and the decrease in milling quality of wheat from improper drying. Artificial drying of wheat and soybeans, however, is not frequently required.

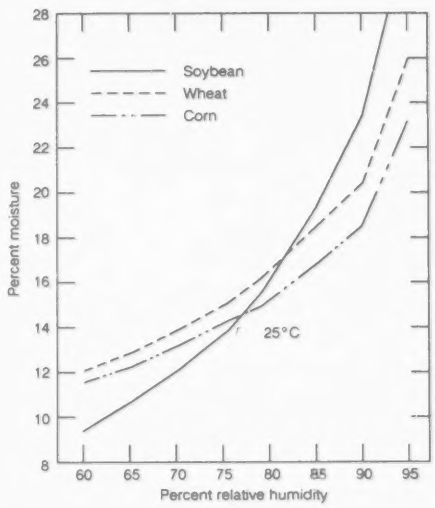
The main dryer operating factors affecting grain quality are air temperature, grain velocity, and airflow rate. A dryer operator is able to adjust the first two on every dryer and, on some units, can adjust all three. Collectively, the three conditions determine the drying rate and maximum temperature of the grain being dried, and thus establish the quality of the dried lot.

At least 80 percent of the U.S. corn crop is dried on-farm. On-farm dryers fall into three categories—bin, non-bin, and combination dryers. **Bin dryers generally are low-capacity, low-temperature systems, able to produce excellent quality grain. Non-bin dryers, the most popular type in this country, are high-capacity, high-temperature systems that frequently overheat and overdry the grain, and thereby cause serious grain-quality deterioration.** Combination drying reaps the advantages of both systems (i.e., high capacity and high quality) but requires additional investment, and is logistically more complicated. **A switch by farmers from non-bin drying to combination drying would significantly improve U.S. corn quality.**

Three classes of off-farm dryers are used—crossflow, concurrent-flow, and mixed-flow dryers. Off-farm dryers are high-capacity, high-temperature units. Crossflow models are the most prevalent type used in the United States; they dry the grain nonuniformly and cause excessive stress-cracking of the kernels. Mixed-flow dryers are common in other major grain-producing countries; the grain is dried more uniformly in these dryers and is usually of higher quality than that dried in crossflow models. Concurrent-flow dryers produce the highest quality grain; their main disadvantage is the relatively high initial cost. A change from crossflow to mixed-flow or concurrent-flow dryers would benefit U.S. grain quality.

Moisture content and uniformity within a storage facility is critical to maintaining grain quality. The interaction between moisture, temperature, and relative humidity may spur mold growth, increase insect activity, and cause other quality losses (figure 1). Basically, grain moisture in equilibrium with 65 percent relative humidity will support mold activity, but different grains will create the equilibrum with relative humidity at different moisture levels. That

Figure 1.—Moisture, Temperature, and Relative Humidity Interactions



SOURCE: Office of Technology Assessment, 1989

is why wheat and soybeans cannot be stored at the same moisture content as corn. When controlling insects, high moisture content increases absorption of fumigants such as methyl bromide, requires an increase in dosage, and accelerates the breakdown of pesticides such as malathion.

The equipment and methods used to fill a storage bin affect the performance of aeration systems used to control the effects of moisture/temperature/humidity. Dropping grain into the center of a bin causes a cone to develop, with the lighter, less dense material concentrating in the center (in spoutlines) while the heavier, denser material flows to the sides. This impedes airflow during aeration, and fosters mold growth.

In large horizontal storage areas, loading from the center or from a loader that is gradually moved backward through the center of the building as the pile is formed causes similar problems. If grain is piled over aeration ducts on the floor by moving the loading device back and forth, airflow will be greatly increased. However, airflow distribution is not as uniform as in upright bins. Some methods of filling piles also result in segregation of fine materials. These accumulations are more subject to insect and mold growth, and they divert airflow. But piles are difficult to aerate and the shape of some restricts uniform airflow.

Nonuniform moisture levels can lead to spoilage in localized areas within a storage facility. Moisture and temperature within a grain mass will not remain uniform over time. Moisture will migrate in response to temperature differentials. If the outside air is warmer than the grain, the circulation reverses, and the area of condensation shifts to several feet below the grain surface, although still in the center.

The effect of moisture migration on storage is that grain assumed to be in a storable condition is not. Cold weather migration primarily affects grain in land-based storage, causing deterioration as temperatures rise in the spring Warm weather migration is particularly vexing for grain in transit from cold to warm areas of the United States and from the United States

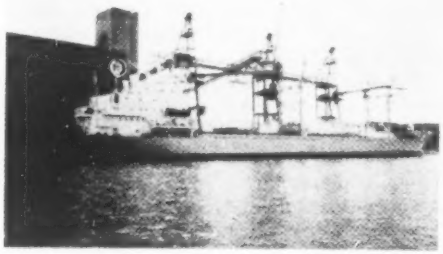


Photo credit: OTA Staff Photo

Moisture migration resulting in grain spoilage can be a problem during shipment since grain can undergo several outside air temperature and humidity changes during the 30 to 50 days in transport to the foreign buyer.

through warm waters to foreign buyers. A barge or ocean vessel is basically a storage bin and will experience the same migration phenomena as land-based storage facilities.

Broken Grain and Fine Materials.—Some grain damage or breakage generally occurs whenever grain is harvested. Overall, damage is always much greater in extremely wet or extremely dry grain. When grain is harvested at high moisture levels, the kernel is soft and pliable. Moist kernels deform easily when a force is applied and greater force is needed to thresh wet kernels than dry ones. Thus, wet kernels suffer more damage than drier ones. However, drier kernels can break when the same force is applied. Different optimal conditions thus exist for each grain.

In addition to grain breakage, factors such as weed control and kernel density, especially in wheat, also affect a combine's ability to harvest and deliver clean grain. Cutting below the lowest pod or wheat head inadvertently introduces some soil into the combine. Most soil is aspirated from the rear of the combine unless the soil particles are about the same size as the kernel, in which case they pass through the cleaning sieves with the grain.

Harvesting technologies normally separate and remove material larger than the grain (such as plant parts) and material significantly smaller

(like sand and dirt). Sloping terrain, however, can affect this process. Side slopes also create problems since the tendency is for material to congregate on the downhill side of the cleaning shoe.

The main factor affecting the combine's cleaning performance is the amount and type of weeds present in the field during harvest. Weed control is one of the most serious problems facing many U.S. wheat producers. This is also true for Southeastern U.S. soybean-producing areas, where a warm, wet climate is conducive to weed growth. The amount of weeds affects not only grain yield, but also the amount of foreign material present in the harvested grain and the combine's ability to remove this material.

Combines are being modified to improve their performance in weedy fields. In the case of wheat, kernel size has been decreasing, which complicates this modification. The trend toward smaller kernel size is a concern because the seeds of most grassy weeds are smaller and lighter than wheat. Thus, smaller wheat kernel size reduces the margin between wheat and weed size and, therefore, increases the difficulty of cleaning within the combine.

Rapidly drying moist grain with heated air causes stress cracking. The drying operation itself does not cause grain breakage, but can make grain more susceptible to breakage during handling later. **Cleaning grain before it reaches the dryer can improve dryer efficiency.** Introducing clean grain to the dryer:

- results in a more uniform airflow in the dryer and thus a more uniform moisture content of the dried grain;
- decreases the static pressure (airflow resistance) of the grain, thus increasing the airflow rate and dryer capacity; and
- eliminates the drying of material that detracts from final grain quality.

Obviously, precleaning also has disadvantages. It requires additional investments in cleaners; the handling of wet, broken grain and fine material; and the rapid sale of wet, easily molding material; and it results in some dry-matter loss. Although the advantages of precleaning wet grain are fairly well understood by dryer operators, most avoid precleaning. The quality of the U.S. grain crop would improve substantially if precleaning were adopted.

Mechanical damage during handling results in grain breakage, which produces broken grain and fine materials. This causes a decrease in quality, greater storage problems, and an increase in the rate at which mold and insects tend to invade stored grain.

Research shows that breakage in handling is more significant for corn than for wheat and soybeans. Higher moisture content and higher temperatures prove to be the best conditions to minimize breakage but are opposite of the optimal safe storage moisture and temperature. The effect of repeated handlings on grain breakage is cumulative and remains constant each time grain is handled or dropped. This is true whether or not the broken material is removed before subsequent handlings.

The impact of grain breakage and fine materials on all aspects of the system has resulted in the need to clean grain. Cleaning wheat in commercial handling facilities is normally limited to removing dockage, insects, and, to a limited degree, shrunken and broken kernels. For corn, cleaning regulates the amount of broken kernels and foreign material; for soybeans, it affects the amount of foreign material and split soybeans.

Cleaning corn to remove broken kernels and foreign material is required at each handling in order to meet contract specifications and avoid discounts. For wheat, however, most dockage is generated during harvest, and normal handling does not cause significant increases. Therefore, cleaning is not required at each handling. Soybeans, on the other hand, fall somewhere in between regarding their breakage susceptibility and the amount of cleaning required at each handling.

The amount of grain cleaning required prior to storage involves the factors of risk to grain deterioration as a result of mold and insect invasions and the costs associated with maintaining quality. Broken grains, grain dust, and other

fine materials have the greatest effect on the performance of insect control interventions. When a protective treatment is applied, grain dust may absorb much of the insecticide, which reduces the effectiveness. Likewise when a fumigant is applied, concentrations of dust and fine material may require increased dosages to penetrate the grain mass. Dust also inhibits penetration of fumigant gases causing nonuniform penetration.

Ability of System to Maintain Quality.—Technologies are in place to harvest, maintain, and deliver high-quality grain. Each technology must be used, however, in a manner that is conducive to maintaining quality.

Although the data indicate that nearly any combine can deliver acceptable grain quality, farmer-operated combines tend to record more damage than the combine should deliver. From a technology standpoint two areas need emphasis:

1. increased education to help operators better understand the interactions of cylinder/rotor speed, concave openings, fan speed, and sieve openings with grain quality and losses; and
2. more monitoring devices and possibly automatic controls on combines to help operators adjust or fine-tune the combine.

Weed control and its relationship to kernel size and density are critical to optimum combine performance. Unless new technologies addressing this area are developed or improved weed control measures are forthcoming, the combine's ability to harvest and clean grain will continue to present problems.

A significant improvement in grain quality can be obtained by optimizing the dryer operating conditions of existing crossflow dryers, by precleaning wet grain, by selecting the best grain genotypes, and by installing automatic dryer controllers.

Molds will grow on any kernel or group of kernels that provide the right conditions. Therefore, moisture content and uniformity within storage facilities are critical to maintaining grain quality. **Maintaining low temperatures and moisture levels in grain is the principal way to preserve grain quality and prevent damage from molds and insects.** Aeration is also a very effective tool. The rate of development of both molds and insects is greatly reduced as temperature is lowered.

Many storage bins, especially on the farm, are equipped with aeration systems but often are not used effectively. Farm storage bins, especially smaller and older ones, generally are not aerated. Small bins will cool or warm quickly enough with the changing season that moisture condensation may not be a serious problem. A majority of farm aeration systems are either not operated at all or not used enough. The most common problem is not running the fans long enough to bring the entire grain mass to a uniform temperature level. If a cooling front is moved through only part of the grain, a moisture condensation problem is likely at the surface where the warm and cold grain meet.

In addition to aeration, the turning and transfer process mixes grain and contributes to a more uniform moisture and temperature. In facilities not equipped with aeration, turning has been the traditional means of grain cooling. This approach requires much more energy than aeration does, however, and it can contribute to physical damage by breaking the kernel.

Grain in horizontal or pile storages cannot be turned because of the difficulty in unloading and moving it. In order to turn grain, a handling system must have empty bins that are connected by a conveying system. This is not the case on most farms.

Most grain storage facilities provide a natural habitat for certain harmful insects even when the facility is empty. Grain residue trapped in floor cracks and crevices, in wall and ceiling voids, and on ledges provides an ample supply of food to sustain several insect species. Thorough cleaning is the first and most effective step toward preventing insect infestation of freshly harvested grain. Because insects live from season to season, cleaning and removing trash and litter is important. Also, a thorough cleaning should precede any insecticidal

treatment of storage facilities if the full value of the treatment is to be gained.

For several reasons, such as remoteness of facilities, small amounts of grain to be treated, and lack of information, farm storage facilities are often the inappropriate site for insect control treatment. Grain that has not received a properly applied treatment can become mixed with noninfested grain when marketed, magnifying the problem and creating greater loss and the need for more expensive and time-consuming remedies later.

The high-speed, low-cost U.S. grain system does not readily accommodate special quality needs. While these needs can be met by slowing belt speed, installing and using cleaning equipment, eliminating unneeded handlings, and preserving the identity of grain, most of these actions increase costs.

All factors affecting quality just discussed—nonuniform moisture, moisture migration, temperature and humidity, insect invasion, and mold development—have an impact on grain quality during shipment. No mode of transportation is equipped with aeration, nor can grain temperatures and corrective actions be taken during shipment. Moisture migration can be more dramatic since grain may undergo several outside air temperature and humidity changes. This is especially true when grain is loaded in a cold climate and transported through warm waters rather quickly to a warm, humid climate. Therefore, moisture uniformity is critical to maintaining quality during shipments.

The interactions between technologies regarding moisture content and breakage on grain quality are evident. Each technology is capable of preserving grain quality. Once inert material such as weed seeds, dirt, stems, cobs, and so on are removed from the grain, no further cleaning is required. But grain, especially corn, must be cleaned to overcome breakage that is inevitable due to handling in the system. Once grain quality deteriorates at any step in the process, it cannot be recovered.

Photo credit: OTA Staff Photo

The efficiency of the U.S. grain handling and transportation system exceeds that of nearly all other countries. This high-speed low-cost system, however, does not easily accommodate special quality needs.

Grain Standards

Standards should reward positive actions, such as genetic improvement and sound harvesting, drying, and marketing practices. They should also incorporate descriptive terminology that provides the best information available on the value of each shipment. **All changes must be evaluated against the criterion of providing information that is worth the cost of obtaining it.** Optimum information, not maximum information, is the goal. Proposals for change must be tempered by current capabilities of the industry, the cost of adjustments versus poten-

tial benefits, the realities of international trading rules, and history of the grain industry. Measurement and description of quality is only one part of the problem. Quality must be evaluated in the context of technology, competition, foreign demand, and processing requirements.

Current grain standards are limited in four important ways:

1. They create incentives for practices inconsistent with good management and efficiency.
2. They fail to identify many of the characteristics related to value in use.
3. They fail to reward producers and handlers for improved drying, harvesting, handling, and variety selection.
4. Grade limitations on many factors are arbitrary, sometimes not reflecting real differences in value, and in some cases are not consistent with statistical principles.

No ideal standard will be found, and any revisions would have to consider trade-offs. To move toward an ideal system, grain standards should be changed to include:

- grade-determining factors;
- non-grade-determining factors; and
- definition and measurement technology for official criteria.

Grade-determining factors should relate to sanitary quality, purity, and soundness (absence of imperfections). Grade would be based on factors such as impurities, foreign material, total damage, and heat damage. The lower the values of any of those defects, the greater the value of the product.

Non-grade-determining factors would address properties such as broken kernels, moisture, oil and protein content, and other intrinsic characteristics or physical properties that influence values for major processing uses. Higher or lower percentages for those do not necessarily mean higher end-use value. Many chemical and physical properties that influence the quantity and quality of products derived from grain probably are yet to be identified. More research may add to the list of properties. The criteria for inclusion should be that the cost of obtaining the information is less than the value of that information to users who need it. By starting with the major products generated from each grain, a list of physical and chemical properties can be developed that are correlated with the value in use. New rapid testing technology is also a requirement prior to inclusion.

Official criteria factors would be those requested by buyers and sellers. These would be developed only after evidence of sufficient demand to cover the cost.

Grain can be inspected many times as it moves from the farm to its ultimate destination. Normally it is tested for one or more important characteristics each time it is loaded into and out of a grain elevator. The number and type of tests varies, from those provided for in the grain standards to measures of intrinsic characteristics not covered by the regulations.

The U.S. Grain Standards Act (USGSA) requires that standards be developed and used when marketing grain. **Even though the tests provided for in the grain standards must be used, no requirement exists on who will perform the tests and what tests will be performed on grain moving domestically in the United States.** In fact, two U.S. Department of Agriculture agencies are authorized to perform testing services using the grain standards on domestic grain movements. The only mandatory testing is performed by the Federal Grain Inspection Service (FGIS) on export grain.

Since no single policy on inspecting grain exists, no one group is responsible for developing and overseeing the tests and equipment being used. Regardless of which tests are performed and who performs them, several factors are important to testing. These include instrument precision, instrument standardization, the choice of reference methods and traceablility to standard reference methods when developing rapid objective tests, calibration, and natural error resulting from sampling.

As the relevance of additional tests performed on an ongoing basis becomes clearer, the need for standardizing equipment and procedures becomes more critical. Also, criteria must be established to govern the design of rapid test equipment. However, development of rapid tests must meet the basic criteria associated with standardization, traceability to standard reference methods, and calibration. In addition, rapid tests must be evaluated in terms of speed, cost, accuracy, durability, and capability of handling wide ranges in quality.

Buyers' Attitudes

An extensive survey of domestic and overseas grain buyers was conducted for this study to determine their attitudes toward quality, grain standards, and merchandising practices. Several general points of importance were clear.

First, to determine what is considered quality for any given grain, the ultimate use must first be known. Each domestic and overseas industry has defined quality in terms of the areas important to its markets.

Regarding key attributes not currently covered by grain standards, no one set of quality attributes for wheat meets the demands for all wheat products. Differences in what are considered important attributes exist between domestic and overseas wheat millers and by region of the world. Protein, hidden/dead insects, falling number, pesticide residue, mycotoxins, and dough handling tests were considered the most important. Falling number and pesticide residue were identified by both groups as tests that should be included in the wheat standard. Hidden or dead insects were also identified by domestic millers for inclusion.

Photo credit: OTA Staff Photo

The near-infrared-reflectance analyzer (NIR) is the most advanced rapid objective testing technology. It currently is used to measure protein content in wheat. It will soon be used to measure oil and protein content in soybeans and corn protein.

For corn, the determination of important attributes is industry-dependent except in areas regarding wholesomeness, health, and safety. Items such as stress cracking, breakage susceptibility, and hardness are more important to wet and dry millers than to the feed industry. However, attributes such as pesticide residue, mold, mycotoxin, and hidden/dead insects are important to all those surveyed.

Commonality of important attributes is more evident in soybeans than in wheat or corn between domestic and overseas processors. The most important attributes are protein, oil, and free fatty acid content.

Second, the grain system's ability to deliver important quality attributes consistently is as important as the attributes themselves. Problems with uniformity are especially acute in wheat and corn. As processing technologies become more sophisticated, the demand for uniformity will become more critical.

U.S. Farm Policy

Two important features of U.S. farm policies have an impact on several aspects of quality. **The inverse relationship between yield and intrinsic quality (e.g., protein in wheat) means the target price program) has a negative long-term impact on intrinsic quality.** This is because the target price typically exceeds the market price, creating an incentive to expand yields. Impacts vary by grain and region, depending on the extent of the inverse relationship. When target prices, which are based on yield, exceed market prices and if the premiums associated with the measure of intrinsic quality are unchanged, there are incentives to increase yield at the expense of intrinsic quality. This effect has been

exacerbated in previous farm bills, which used different methods of determining yield. The total impact in the case of wheat has been to force market premiums for wheat protein to relatively high levels in order to neutralize producers' decisions.

Administration of the loan rate program also has an impact on intrinsic quality, as well as on physical and sanitary quality. **In particular, the market for measurable quality characteristics is distorted due to the fact that premiums and discounts on forfeited grains, especially wheat, are less than those determined in the market.** Poorer quality grain is put under storage, and market differentials are depressed.

Changing Role of Demand

Wheat, by its very nature, is the most complex of the three grains for defining quality because of the vast array of products and processing technologies used to produce the products. Corn is somewhat less complex in that fewer products are produced and quality concerns can be traced to the individual industries. On the other hand, the quality required by one corn industry is not necessarily important to others. This creates a situation whereby decisions regarding corn quality must be assessed in terms of major usage. Quality concerns of different industries using wheat are somewhat overcome by the fact that different types of wheat exhibit different properties. Soybean quality is the least complex issue because the vast majority of soybeans are used to produce oil and meal.

The varying quality requirements exhibited by these industries highlight the need for the United States to become more aware of individual industry requirements if the goal is to produce and deliver high-quality grain. The United States has developed the reputation as a consistent supplier for any type and quality of grain desired. **To become a supplier of high-quality grains, it must become more quality-conscious and develop a reputation as a high-quality supplier.** The Nation must understand the specific quality requirements of its customers in order to match them with the quality delivered, and must become more aware of the dynamic issues surrounding the qualities required by the marketplace. Areas such as technological advancements in processing technologies, government policies, customer preference, development of new finished products, and consumption patterns all affect customers' purchasing decisions and their definition of quality at any one point in time.

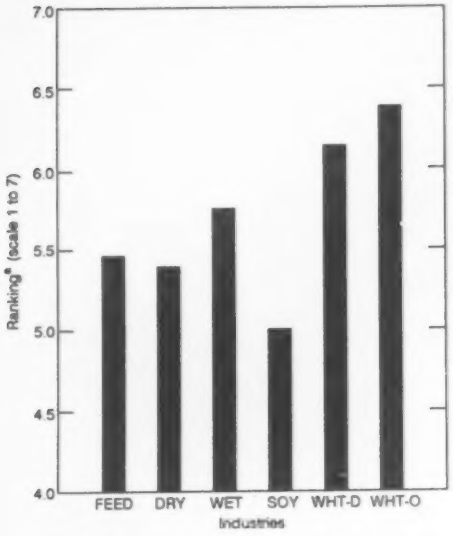
Quality in the Marketplace

Quality attributes required by individual industries directly relate to the processing technology used and the needs of the various finished products. In the case of corn, what may be considered high quality to feed manufacturers is not necessarily high quality for the wet and dry milling industries. Wheat, used in a multitude of products, has quality requirements that differ not only by type and individual product, but between mills using the same type of wheat to produce flour for the same type of product. Baking technologies for wheat flour vary not only in the United States, but also within and between countries using wheat purchased from the United States; so defining one set of wheat quality characteristics for even one type of wheat or flour is not useful.

High quality, as defined by the specific attributes required by each industry, is constantly changing. However, the ability to produce and deliver high-quality grain can mean more than just providing grain that meets specific test results. What constitutes high quality from the customer's point of view can range from special handling (low-temperature drying of corn) to the uniformity of specific attributes within and between shipments.

The OTA survey specifically asked respondents to rank the importance of uniform quality between shipments (figure 2). **Domestic and overseas respondents considered uniformity between shipments as being important even though they differed on which attributes were more critical.** The results from the question regarding overseas millers' preference for U.S. wheat compared to that of other exporters further demonstrates the importance of uniform-

Figure 2.—Importance of Uniformity Between Shipments



ABBREVIATIONS:

FEED = Feed manufacturers
DRY = Dry millers
WET = Wet millers
SOY = Soybean processors
WHT-D = Wheat millers (domestic)
WHT-O = Wheat millers (overseas)

[a]4.0 Neutral
5.0 Slightly important
6.0 Moderately important
7.0 Extremely important

SOURCE: Office of Technology Assessment, 1989

ity. **Canada and Australia stress uniformity between shipments and this fact generally accounts for wheats from these countries being ranked as first choice.**

To further complicate the task of identifying important quality attributes for specific industries, some traditional measuring technologies are not accepted by certain industries producing the same product. This fact stood out in OTA survey results for domestic and overseas wheat millers. Tests for rheological properties (extensograph, alveograph, and mixograph) were considered more important by overseas wheat millers than by domestic millers. And even though overseas millers considered these tests important, their importance varies by region of the world.

As processing technologies become more sophisticated through automation or as more demanding qualities are required for finished products, the need for specific attributes within well-defined ranges becomes more critical. Technologies for baking bread, rolls, and similar products in large bakeries have advanced significantly. While bread can be made by hand using low-protein wheat, large dough-mixers and other equipment found in large automated bakeries place too much stress on low-protein flour, resulting in unacceptable finished products. The differences in how flour will be baked plays a very important role in determining the specific values for the various attributes required of the flour.

In addition to advances in processing technologies, technological advances in other areas can have an impact on the quality required by different industries. For many years, high-protein wheats have been blended with low-protein wheats to strengthen flour. More recently, vital wheat gluten, a product containing 75 to 80 percent protein, has been used as a flour fortifier. The recent expansion of vital wheat gluten production is the result of technological improvements in breadmaking, rapid population growth, and increasing trend toward urbanization in some countries.

Many countries striving to become self-sufficient in wheat production are producing vital wheat gluten to fortify locally produced low-protein wheat. Some European processors are also producing isoglucose, a sweetener and sugar substitute, from wheat starch (that portion of the wheat kernel remaining after the gluten is extracted) to produce something similar to corn sweetener in the United States.

Corn, which has always been considered mainly as an animal feed, is beginning to experience pressures in areas similar to those affecting wheat. As feed manufacturing becomes more sophisticated and automated, and as customers (especially in the poultry industry) need strictly controlled and balanced diets, the demand for quality attributes and consist-

ency in delivering these attributes is taking on increased importance. In other cases, individual corn dry and wet milling companies are placing more stringent demands on the quality of corn they purchase. Companies are contracting with farmers to grow certain varieties and perform special handling, such as low-temperature drying.

Traditional quality attributes, even though varied, may be influenced by technological advances, economic concerns, and government policies here and abroad. **For the United States to produce and deliver high-quality grain, it must not only become increasingly aware of concerns over quality expressed by domestic and overseas industries and match quality to their wishes, but it must understand the reasons why countries purchase grain in the first place.** Knowledge of customer preference, consumption patterns, and the role of government policies is critical when considering steps the United States should take to enhance the quality of grain in international trade.

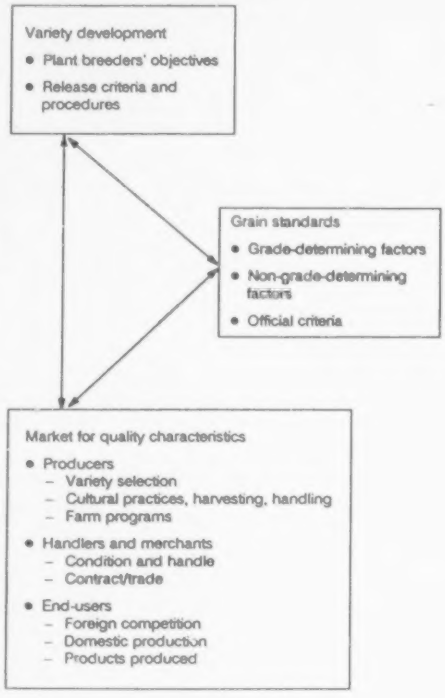
POLICY OPTIONS

The overall purpose of any policy change related to this grain issue must be to create an environment that enhances grain quality. In general, the important features of the U.S. grain system are breeding, handling, grain standards, and the market for quality characteristics. Each has an effect on grain quality. Institutions, policies, and trade practices have an impact on these sectors, and therefore on quality. **Policy discussion in this country has traditionally focused on only one component of the system—grain standards.** Yet given that it is the operation of the overall system that influences grain quality, a far greater number of policy options exist than are normally discussed.

The notion of interdependence in the production and marketing system with respect to quality is illustrated in figure 3. This triad could be viewed as a three-legged stool; each leg has an impact on quality as well as on the system.

Premiums and discounts for quality characteristics are determined in the market, where buyers and sellers interact. Producers make varietal and agronomic decisions in response to incentives. These, however, are also influenced by farm programs. The demand for characteristics is influenced by end-use needs and foreign competition. Merchants and handlers procure, handle, condition, and blend grain to meet contract specifications. In addition, they make offers on what they can sell, and at what price differentials, based on the availability of quality characteristics and their conditioning

Figure 3.—Components of the Interdependent Grain System



SOURCE: Office of Technology Assessment, 1989

capabilities. Each activity is influenced by the incentives established in the market, by trading rules, and by grain standards, which provide a description that is useful for transactions and which therefore facilitate trade. Relevant end-use characteristics generally are not included in grain standards, however.

The objectives of public and private plant breeders in variety development include yield, disease resistance, harvestability, and quality. In addition, participants have procedures and criteria for variety release. Ultimately, the market for seed determines the success of varieties. Some characteristics, e.g., yield, are more easily measured than others by market participants. Breeders also have some control over intrinsic quality characteristics that are not easily measured in today's marketing system.

The interdependence of the system's components must be recognized in the evaluation of policy options with the objective of establishing a more integrated relationship among them. In a number of other grain exporting countries, the policies are more integrated and better coordinated. In fact, the United States has made no effort to coordinate or integrate policies affecting these activities. Any policy on grain standards will affect varietal development and the efficiency of the market for quality characteristics. Similarly, any policy affecting the market (e.g., incentives) will have an impact on variety development and grain standards. The inability to measure intrinsic characteristics in grain standards has implications for policies affecting the market and variety development.

Policy changes could be focused on any system component, but the effectiveness must include impacts elsewhere. A number of phenomena that influence quality (e.g., weather) cannot be affected by policy and a number of policies are short-run and only treat symptoms. **Policies developed here aim to affect underlying causes of the problem, which over the long term would result in improved quality. Thus the policy options are limited to three general categories—variety controls, market intervention, and grain standards (table 2).** Within each are a multitude of alternatives, and only selected ones are presented. Policies available are a continuum within each category rather than discrete choices, as implied by the table. **The emphasis here is that policy should take the long view, and it should have the objective of coordinating policies across the three sectors.**

Variety Controls

Three important considerations lead to the policy options listed under variety controls. First, with few exceptions grain standards do not measure important intrinsic characteristics. Second, intrinsic quality characteristics differ significantly across some grain varieties. Third, varieties are not visually distinguishable, thus segregation in the market system is precluded, resulting in increased uncertainty in end-use quality. These three points apply to some extent to each of the grains. The classic case is that of wheat, in which performance varies across varieties, and increasingly it is becoming difficult to differentiate wheat in the marketing system. In some of these cases it may be easier to identify variety, or groups of varieties, than intrinsic characteristics. Further, identity of a variety provides more comprehen-

Table 2.—Fundamental Policy Alternatives

Variety controls	Market intervention	Grain standards
No change	Marketing board	Mandatory USGSA inspection
Variety identification/ categorization	Export bonus	Single agency to approve testing
Variety licensing	No change in loan policy	Mandatory USGSA inspection in conjunction with NIST equipment approval
	Increased differentials in government policies	
	Minimum quality specifications for farmer loans	

SOURCE: Office of Technology Assessment, 1989

sive quality information than any subset of measured quality characteristics.

Domestic processors attempt to resolve problems of varietal differences, to some extent, by purchasing by location or region. Foreign buyers, however, or in general any buyers using purely grade specifications are precluded from this alternative.

No Change

Maintaining the status quo has four main implications. ***First*, intrinsic quality characteristics will continue to lack uniformity among States/regions/shipments.** In the current system, with only informal, uncoordinated variety release criteria, many basic characteristics differ among varieties. These characteristics lose their identity in a market incapable of measuring end-use characteristics. Consequently, important intrinsic quality differences existing regionally are not detected in the marketing system.

***Second*, problems will be created elsewhere in the system due to the inability to measure intrinsic quality.** In particular, increased pressure would be placed on grain standards to measure intrinsic quality within the marketing system.

***Third*, the current lack of information on intrinsic quality in some grains will continue, reinforcing current inefficiencies in the market.**

***Fourth*, productivity growth would be facilitated to a greater extent given complete freedom on variety release and selection.**

If there is no change from the current system of administering variety release, the pressure on grain standards to introduce measures of intrinsic quality will increase. Other countries use variety identification and release procedures in part to reduce the pressure on grain standards to measure intrinsic quality. Alternatively, by incorporating intrinsic quality into farm program policies (discussed later), at least some incentive could be built into the system to improve intrinsic quality.

Variety Identification Categorization

Any sort of variety identification or control scheme would pose administrative challenges. **One alternative would be to provide a mechanism in which varieties can be identified in the market system. Such mechanisms currently exist and are used in other exporting countries. These consist of an affidavit system, random testing using electrophoresis, and categorization.** Producers would declare the variety at the point of first sale or loan application. This would provide information to handlers on segregation based on grain categories or groups of varieties. Categories would be developed according to end-use similarity and could become part of the grain standards.

Alternatively, variety or groups of varieties could become part of the contract governing the transaction, as is the case in the French system. The number of categories established would vary by grain, depending on the three considerations just discussed and on end-use specificity. Thus, for example, if only one end use existed and the varieties did not differ sufficiently with respect to intrinsic quality, only one category would be necessary. On the other hand, for wheat, in which there are intrinsic differences across varieties and a multitude of end uses, there would be a larger number of categories. The intent here would be to formalize a mechanism not dissimilar from the current system of classification for wheat. The difference, however, is that the current system for classification relies on visual distinguishability, and categorization is based on fairly imprecise criteria.

A variety control scheme would increase information (by category of varieties), thus increasing the efficiency of the market in its allocative role. For most grains, variety is a better indicator of quality than are selected tests for quality. Thus, buyers' information regarding quality would be improved. The increase in information would raise the efficiency of the market, resulting in improved signals being transmitted to producers, breeders, and end-users.

Such a program would pose a challenge for administration in the United States, especially given the numerous varieties currently grown. It would be further complicated by the fact that intrinsic quality depends not only on variety but also on where it is grown and on local climatic factors.

Contract specifications would increase in complexity. The informational requirements for contract specification would increase, particularly of foreign buyers. Depending on the extent of categorization, however, this complexity could be reduced.

Introduction of a variety identification scheme would result in incentives and disincentives being readily associated with varieties with desired/undesired intrinsic characteristics. In addition, using a variety identification scheme would reduce pressure on the grain standards to measure intrinsic performance in the marketing system. Categorization of varieties would serve that function.

Variety Licensing

A more restrictive approach would be to institute a variety licensing scheme. Varieties would be subjected to criteria administered at a national level for release into the market system. Licensing of varieties takes various forms in different exporting countries—from quite restrictive, such as in Canada and Australia, to fairly neutral, as in France. The intent of each, however, is to provide some mechanism that assures certain intrinsic characteristics, given that they cannot be easily detected in the market system, and to apply uniform criteria throughout the country, i.e., to reduce uncertainty of intrinsic characteristics through uniform application of release criteria. Administration would require procedures similar to those of the variety identification system just described. In addition, some criteria would have to be established for categorization (i.e., to license varieties by end use), and for administration.

Licensing varieties would increase uniformity and raise the ability to control intrinsic quality. A formal mechanism could be provided for categorization relative to a simple variety identification scheme. Due to locational differences in quality, varieties would have to be licensed by location and by end use.

Depending on administration, this scheme could be viewed as restrictive, i.e., of productivity growth. However, this is not necessarily the case, as the situation in France indicates. This approach would be difficult to implement, complex to enforce, and likely to create a bureaucracy.

A stricter variety licensing system would have similar effects on other parts of the system as just discussed under variety identification. In particular, licenses could act as surrogate grain standards for intrinsic characteristics.

Market Intervention

Marketing Board

Central to the U.S. system is the market in which prices are established. Embedded in this market, and all prices, are premiums and discounts for measurable characteristics, which allocate grain across different users. In addition, these quality characteristics provide incentives and disincentives for participants throughout the marketing system. Several other countries accomplish this by some form of board control. **Thus, one option would be to introduce a marketing board system in the United States to resolve quality problems.** The emphasis of the discussion here is on the implications of a board for quality, in particular, and the coordination of policies on quality. Other aspects of a board operation are more far-reaching (e.g., bargaining power, resource allocation, impacts on non-board grains, impacts on physical coordination) and are not discussed here.

A primary benefit of a marketing board would be to coordinate the many aspects of the production and marketing system that have an impact on quality. Quality would be improved to

the extent that only two transactions—one between producer and board, and another between board and buyer—would take place. This is in contrast to the multitude of current transactions, all requiring measurement of quality.

Administration of price differentials would be more subjective and judgmental in such a system since transactions would take place without an active market. Indeed, market determination of price differentials is an important advantage and role of the U.S. marketing system.

Operating a grain marketing board in the United States would be costly, given the complexity and breadth of the system. Countries with boards operate in relatively simple logistical systems, and with few grains. When either of these increases, as would be the case in the United States, the problems associated with bureaucratic allocation decisions intensifies. The highly efficient U.S. grain handling and distribution system, due in part to the competitive environment, would be lost in a board-type system. Thus, it is likely the costs of imposing a board system in the United States would outweigh the benefits of quality improvements.

Imposition of a board system could reduce the emphasis on grain standards at the point of export, and for that matter throughout the system. This is presuming that sufficient earlier controls were imposed to resolve grain quality problems, thereby reducing the importance of quality measurement at the point of export. In addition, variety release procedures could be easily administered in a board system. Incentives could be administered rather than having to rely on market determination.

Export Bonus

An alternative policy would be to establish a bonus payable to exporters who deliver grain having quality superior to that specified in the contract. Conceptually, this addresses the system's merchant-handler component. This policy is discussed in the context of being applied at the point of export, but in general it could be applied elsewhere in the marketing system.

An export bonus program could have immediate results, especially if tied to a physical or sanitary quality characteristic. It would result in an increase in quality perception, or in attention to the issue. Longevity should be a concern, however, in that if terminated, the effects likely would not last.

Administration would be costly. Several important administrative points would need to be considered. First, which quality characteristic(s) would be tied to the bonus—physical, sanitary, or intrinsic? Quality would improve on whatever characteristic received a bonus. Depending on longevity, however, the bonus would likely not influence intrinsic quality. Second, should the bonus be applied at the point of export or origin? One risk is that importers may manipulate the system by specifying a lower grade in order to receive the same grade they traditionally purchase, but at a lower price.

An export bonus program, by definition, would be oriented to the merchants and handlers in the system. It would provide incentives for them to improve the quality on particular attributes and for particular shipments to which the bonus was applied. Due to competition within the industry, any benefits would be distributed to appropriate decisionmakers so as to provide incentives. **More information would not be provided to the market, however, nor would there be a reduction in information uncertainty, so the efficiency of the market would not be improved.** Breeders' objectives and release criteria would be affected only to the extent that the bonuses were applied to intrinsic characteristics, and over very extended time periods.

No Change in Loan Policy

Another option is to leave unchanged the current administration of the policy on loan forfeitures and grain stored for the Commodity Credit Corporation (CCC). The fundamental problem is that price differentials for loan forfeitures and transactions on CCC-owned grain are substantially less than those in the market. The market for quality characteristics is therefore distorted. **The loan and CCC storage prac-**

tices would continue to support the price of lower quality grains. In addition, there would be essentially no change in intrinsic, physical, or sanitary quality from that of the current system.

Lower quality grain under extended storage could deteriorate more than if it were of superior (physical and sanitary) quality. Growers would remain isolated from the market and therefore incentives for improving quality would be masked.

The market is distorted in general in the allocation between storage and commercial sales, with superior quality grain going to the latter. Since the program does not effectively distinguish intrinsic quality, loan rate disincentives are not effective at transmitting signals to producers. **Thus, a major impact of not changing the policy would be to increase the role and function of grain standards in measuring quality.**

Increased Differentials in Government Policies

The administration of premiums and discounts for loan forfeitures and transactions involving CCC-owned grain could be revised to provide incentives to maintain or enhance quality. These could be attached to intrinsic as well as other physical and sanitary quality characteristics. In a number of other countries, quality problems are addressed as a matter of agricultural policy. These take the form of incentives by using regulations and substantial premiums and discounts for quality deviations. Realigning the incentive system via farm policy addresses one component of the system, i.e., the market for quality characteristics. That market already exists and develops premiums and discounts. But it is distorted somewhat by administration of the farm program. This policy option would thus be eliminating a distortion, which would allow the market to function more efficiently. Alternatively, farm policy could take the lead by providing price differentials at least equal to market differentials, to provide incentives throughout the system.

CCC administers programs for handling and storing CCC-owned grain. **Different rules are applied to country and terminal elevators.** CCC requires that terminal elevators deliver the quality represented by the warehouse receipts and it discounts individual railcars. CCC does not pay terminal elevators for overdeliveries in quality. This is not the case for country elevators, which are not subject to the same rejection rules if the quality delivered is inferior to the warehouse receipts and which receive payment for overdeliveries.

One of the few ways to legislate incentives into the system, particularly for intrinsic quality, is via the price differentials in the loan program. This alternative consists of differentials associated with loans to be greater than or, alternatively, equal to the market. They could be applied as currently done, on grades, or on specific physical and sanitary quality criteria. A very simple example would be a 4-cents/bushel price differential for clean wheat (i.e., less than 0.5 percent dockage). In addition, measures of intrinsic quality (e.g., falling number in wheat, oil content in soybeans, or protein content in corn) could be incorporated, as in other countries.

Because the relationship between market prices and loan values varies across grains, and because the participation rates vary, this policy would have a greater impact on wheat than on other grains. In addition, its impact would only be periodic due to the loan not being effective all the time.

If the loan supported prices of higher quality grain, lower value grain would be forced into the market, as opposed to into the loan program, as currently happens. Thus, there would be an increase in the amount of grain going into alternative uses, with lower end value. The most vivid example is the use of wheat as animal feed. Incentives for intrinsic quality could be relatively easily incorporated into the loan program (i.e., relative to measuring them in the marketing system).

Some type of mechanism for quality measurement would have to be developed for grain going under loan, e.g., through farmers submitting samples. Establishment of the optimum price differentials would be difficult to admin-

ister. This is especially true given the large number of U.S. markets and given that—at least in the past—loans have to be announced long before crop quality is determined.

Country elevators would be forced to become more concerned with maintaining quality, and CCC would be guaranteed that the quality of grain received into the country elevator would be delivered out of the elevator. This change in policy would also relieve the pressure of maintaining discount schedules that reflect the market, in that CCC would not accept quality below that specified in the warehouse receipts.

This particular alternative addresses the market for quality characteristics, and provides incentives in an important market for some grains. **Changing the current system would have a number of system benefits. First, to the extent that intrinsic characteristics are used, variety development would be favorably affected.** Signals from this important market would be transmitted directly to breeders and would affect their breeding objectives and release criteria. Thus, this provides somewhat of a surrogate for variety control. **Second, there would be somewhat reduced pressure to measure intrinsic quality in grain standards.** In the extreme of a proactive farm policy, together with variety identification/licensing, the role and function of grain standards could be reduced to some extent toward measuring physical and sanitary quality characteristics.

Minimum Quality Specifications for Loans

An alternative used in many countries is that of minimal receival standards on grain entering the marketing system. Normally grain marketing is integrally related to prices and policies (e.g., initial payments) and therefore it is difficult to isolate physical marketing from pricing. **As developed here, minimum quality specifications would be applied to grain entering the loan program as opposed to grain entering the marketing system.** The global application of minimum quality specifications to the U.S. marketing system would be next to impossible to implement since a majority of grain under loan is stored on farms.

The concept of setting minimum quality specifications for loans is similar to the option just discussed, except that a constraint, rather than a price incentive, is used for entry into the loan. Minimum quality specifications could be applied to physical characteristics (e.g., minimal dockage) or intrinsic characteristics (e.g., variety, protein, falling number, oil, or meal protein). If these were integrated into the loan program, the potential exists for grain not meeting those specifications to be diverted to the export market. One way to help minimize this would be to use whatever quality specification has been established for government programs as a basis for rejecting grain going into an export elevator. This would have the added benefit of reducing the spread of qualities available for blending within the export elevator.

This policy option would have many of the same advantages as increased differentials in government policies. But the minimums would be difficult to establish and maintain in today's political environment. The desirable quality characteristics to be incorporated in the loan program could also be those not easily measured in the marketing system. Depending on the minimum quality specifications (physical, sanitary, intrinsic, or variety), farmers could be required to certify the variety planted or to submit samples of the grain being stored for testing as directed by the U.S. Department of Agriculture.

Use of minimum quality specifications could also solve, or contribute to, the resolution of problems elsewhere in the system. Desirable varieties or intrinsic characteristics, if used, would transmit signals to breeders. These would influence their objectives and release criteria. In addition, the role and function of grain standards in the marketing system as they pertain to measuring intrinsic quality could be reduced to some extent.

Grain Standards

The U.S. Grain Standards Act states that it is Congress' intent to promote the marketing of high-quality grain to both domestic and foreign buyers, and that the primary objective for

grain standards is to certify grain quality as accurately as practicable.

Mandatory USGSA Inspection —

The Federal Grain Inspection Service establishes grain standards, which includes developing technology to measure the factors contained in the standard. The agency also develops and publishes sampling and inspection procedures, evaluates and approves inspection equipment for use during inspection, monitors the inspection accuracy of its employees and licensed inspectors, and periodically tests sampling and inspection equipment for accuracy. Mandatory export inspection is required and a system of delegated and designated agencies, along with FGIS oversight, is in place to perform domestic inspections upon request. **Therefore, a basic structure is in place for approving and overseeing all equipment and procedures used for measuring grain quality characteristics.**

Having mandatory inspection on interstate grain shipments would ensure that the factors covered by the standards are tested using approved equipment and procedures. It would provide consistency in test results in that the identical procedures are used for each inspection in the marketplace and are performed by independent, government-sponsored agencies.

Mandatory inspection would focus the primary responsibility for grain quality measurement on one government agency. The basic framework is in place through the delegated and designated agencies, which already own approved equipment and have trained employees who use FGIS-published procedures. Even though these agencies are in place, their ability to cover the wide areas required to meet the needs of country elevators receiving trucks is severely limited. This fact, coupled with past problems of regulating truck movement, makes this policy option only applicable to railcar and barge shipments.

Imposing this requirement on the market will increase costs associated with obtaining inspection of grain that would not normally have to be inspected (i.e., grain moving from one facility to another owned by the same company).

Approval of Testing by a Single Agency

The National Institute of Standards and Technology* (NIST), through the National Conference of Weights and Measures, standardizes weights and measures by developing specifications for instrument precision and accuracy along with scale tolerances. Currently, NIST addresses neither grain measures other than weights nor sampling equipment. In some instances, individual States have developed criteria for approving inspection equipment and monitored equipment accuracy. (Moisture meters and mechanical truck probes are prime examples.)

NIST, in consultation with FGIS, could take the lead in developing and maintaining equipment specifications and maintenance tolerances. These actions could be in conjunction with developing new tests that would be included in the standards by FGIS. All equipment used to measure grain quality attributes would then be standardized and traceable to national standards. Variations in testing results introduced by a wide range of equipment accuracies would be minimized. **Only approved equipment could be used to provide testing results, and NIST oversight would ensure accurate testing.**

The basic framework is in place for this policy option in that NIST already has established approval procedures, publishes user requirements, and enforces its provisions through State organizations. **Having NIST be ultimately responsible for approving grain testing equipment that serves as the basis for the grain standards has the advantage of placing responsibility in an agency that does not have a vested interest in the equipment's use.** Yet, NIST does not cover tests that are subjective in nature, such as odor, wheat classing, and the determination of damaged kernels. Nor does the bureau have

*The National Bureau of Standards was recently renamed the National Institute of Standards and Technology (NIST) with the passage of the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418) as of August 1988.

any experience in basing a national standardization program on reference methods that are defined rather than proven.

Other than equipment approved by FGIS or individual States, no other equipment is approved. **Converting to approved equipment would result in increased costs for those having to dispose of unapproved equipment and purchase other equipment. This policy option does not address who will use the equipment and when it will be used.**

Mandatory USGSA Inspection in Conjunction With NIST Equipment Approval

A policy that requires mandatory USGSA inspection on grain moving in interstate commerce and a broadening of NIST involvement into grain sampling and testing equipment captures the advantages of both these options while minimizing many of the disadvantages of either.

The advantages of mandatory inspection on railcars and barges moving in interstate commerce ensures that consistent sampling and testing are performed on both subjective as well as objective factors and that one agency is responsible for grain testing as well as standards development. The inability to perform USGSA testing on trucks and at country elevators can be offset to some extent by involving NIST and its related support systems in the grain testing area. Even though USGSA inspection would not be performed, those groups that do perform testing would be required to use approved equipment and to follow user requirements spelled out in the NIST approval. This would be the same equipment and user requirements that USGSA inspectors use.

This policy option would allow country elevators to continue to perform their own testing services on grain received from the farmer, thus reducing the potential increase in costs associated with mandatory USGSA inspection. However, it would create more uniform testing since anyone performing grain quality testing will be required to use NIST-approved equipment and to follow published user requirements. Coupled with the NIST State support systems already in place to oversee equipment accuracy and ensure that user requirements are followed, NIST involvement would provide oversight in previously uncovered areas.

Interaction Between Standards, Variety Control, and Market Intervention

The interdependence between variety control, market intervention, and grain standards is complex. The debate over grain quality has focused primarily on grain standards, but physical, sanitary, and intrinsic grain qualities are a function of the variety planted, farmer practices, environment and geographic location, handling practices, end-user preferences, marketing, government policies, and the system's ability to measure these factors accurately. Therefore, policy options have an impact on many areas, not just on grain standards.

Policy alternatives outlined in the variety control section address intrinsic quality characteristics, since physical and sanitary quality cannot be addressed through such programs. Policy choices discussed in the market intervention section can address the easily measurable factors for physical and sanitary quality, and can be expanded to deal with intrinsic quality attributes once technology is developed to measure them in the marketplace.

In both the variety control and market intervention sections, an option for no change in present policies has been provided. Such an approach places the responsibility for physical, sanitary, and intrinsic quality solely on grain standards. For the physical and many sanitary quality concerns, relying on the grain standards is a relatively simple matter that does not involve adoption of new technology. It involves taking existing factors and applying appropriate criteria. Several factors could be combined (as is the case of foreign material and dockage in wheat, as many have suggested, as either grade-determining or non-grade-determining) or factors could be separated (as is the case with broken kernels and foreign material in corn) to describe quality more accurately. In addi-

tion to rearranging existing factors into grade-determining, non-grade-determining, or official criteria, fixed percentages could be established for certain factors that transcend all grades (e.g., maximum level of dockage in wheat or maximum moisture levels in corn and soybeans). Limits for current factors (e.g., stones or live insects) could also be tightened.

Making no change to variety control systems or market intervention has a dramatic impact on grain standards, however, in that they must be able to address the buyer's desire for information on important intrinsic characteristics and take the lead in establishing signals regarding quality for the entire system. At the moment, technology to measure intrinsic attributes easily in the marketplace is not available. **If standards are to be the vehicle for providing information on intrinsic and many new sanitary quality characteristics (e.g., pesticide residue), resources must be provided to develop the technologies needed to measure them accurately and easily before the market can respond.** It will take many years to research and develop new tests that could be put on-line before signals begin to be transmitted back through the system.

In addition to identifying what factors the standards should measure and whether factors are grade-determining, non-grade-determining, or official criteria, the way the standards are implemented can also have a dramatic impact on grain quality. **One of the major problems facing the United States in terms of grain quality—whether physical, sanitary, or intrinsic—is that all grain, no matter the quality, is accepted into the system and marketed.** This places enormous strain on the system's handling and inspection capabilities and is the cause of most of the blending controversies.

Conclusions

The production and marketing of grain in the United States is a highly interdependent system of activities. Any policy designed to enhance grain quality—physical, sanitary, or intrinsic—must address this interdependence. Traditional policy discussions, however, have focused on only one component—grain standards. But a properly functioning market can solve many grain quality problems. Therefore, a fundamental policy alternative would be one that creates an environment that would improve market efficiency. In addition, appropriate quality information must be provided so that relevant incentives and disincentives can be established to improve market efficiency.

Evaluating policy options in terms of their strengths and weaknesses as well as their interdependence is a complex task. **One possible policy path that maximizes the strengths of the various options as well as minimizes their weaknesses is to adopt variety identification/categorization, increase the differentials in loan policy and specify minimum quality for farm loans, and introduce mandatory USGSA inspection in conjunction with NIST equipment approval.**

Introducing a variety identification scheme would improve information on intrinsic quality characteristics, thus reducing the pressure on grain standards to measure intrinsic performance in the market. For most grains, variety indicates quality better than selected tests do. The increased information resulting from variety identification would raise the efficiency of the market, resulting in incentives/disincentives being transmitted to producers, breeders, handlers, and end users. Variety identification alone, however, does not address physical or sanitary quality concerns, which must be tackled in other areas.

Removing the distortion created by the current administration of premiums and discounts for loan forfeitures and applying the same rules to country and terminal elevators storing government grain would allow the market—which has already established premiums and discounts—to function properly. Grain of lower value would be forced onto the market as opposed to entering government programs. To the extent that intrinsic quality characteristics are included, variety development would be affected. Signals from government programs would be directly transmitted to farmers that would affect their decisions on varieties planted, thus influencing breeders' objectives and release criteria.

Setting minimum quality specifications for loans places an additional constraint on entry into the loan program. These could easily be applied to physical and sanitary quality characteristics as well as measurable intrinsic characteristics and, along with the variety identification scheme, would reinforce signals being transmitted throughout the system. Farmers would be required to obtain testing of grain that was going into the loan program and being stored on farm, rather that self-certifying quality as is presently the case.

Implementing such policies on government programs and minimum quality specifications could force lower quality grain into the export market. **Therefore, minimum quality specifications established for entry into government programs could be applied to grain entering export elevators.** This would transmit signals for improved quality throughout the system and would reduce the spread of qualities available for blending at export locations.

The need for accurate measurement of important characteristics—whether physical, sanitary, or intrinsic—is crucial to providing information for the market to function properly. The vehicle by which quality information is transmitted throughout the system is grain standards. Incentives and disincentives cannot be established unless accurate, consistent, and timely information is provided in the market. **This can be accomplished by continued efforts to incorporate the four objectives of grain standards, by implementing mandatory inspection, and by increasing NIST involvement in approving grain sampling and testing equipment.**

Mandatory inspection of railcars and barges would ensure that consistent sampling and testing were performed. Used in conjunction with minimum quality specifications on grain entering export elevators, this would ensure that one government agency was responsible for testing quality. The increased presence of NIST in approving grain sampling and testing equipment would ensure that all parties testing grain quality used approved equipment and followed basic user requirements.

Grain quality is a function of the variety planted, farmer practices, environment and geographic location, handling practices, end-user preferences, marketing, government policies, and the ability of grain standards to provide information on important quality characteristics. **Present policy does not recognize the interrelatedness of these factors. Policy changes, therefore, must create an integrated policy for enhancing grain quality.**

NOTE: Copies of the report "Enhancing the Quality of U.S. Grain for International Trade" can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325, GPO stock No. 052-003-01139-5.

Other Related OTA Reports

- **Grain Quality in International Trade: A Comparison of Major U.S. Competitors.** Assesses the grain systems of Argentina, Brazil, Canada, France, and Australia includes: overview of each country's production and markets, technologies for producing and handling grain, quality control programs and incentives, and government policy. OTA-F-402, 2/89; 168 p.

  GPO stock #052-003-01140-9; $7.50 per copy

- **Pesticide Residues in Food: Technologies for Detection.** Examines existing and emerging techniques for residue analysis of pesticides and their breakdown products in food; addresses Federal research and programmatic issues relevant to the development and adoption of the technologies. OTA-F-398, 10/88; 244 p.

  GPO stock #052-003-01132-8;$10.00 per copy
  NTIS order #PB 89-136 444/AS

- **Technology, Public Policy, and the Changing Structure of American Agriculture.** Focuses on future and emerging technologies in animal, plant, chemical, mechanization, and information areas and their implications for agricultural structure. Also explores linkages between policy and structure for a clearer understanding of the factors that influence the evolution of the agricultural sector. OTA-F-285, 3/86; 380 p.

  GPO stock #052-003-01018-6; $13.00 per copy
  NTIS order #PB 86-184 637/AS
  Contractor documents are also available from NTIS

- **Technology, Public Policy, and the Changing Structure of American Agriculture: A Special Report for the 1985 Farm Bill.** Special report focusing on three main policy areas of the reauthorization of the Agriculture and Food Act of 1981: commodity, credit, and research and extension. OTA-F-272, 3/85; 100 p.

  NTIS order #PB 86-184 637/AS

NOTE: Reports are available through the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20401-9325, (202) 783-3238; and/or the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-0001, (703) 487-4650.

20-094 (88)